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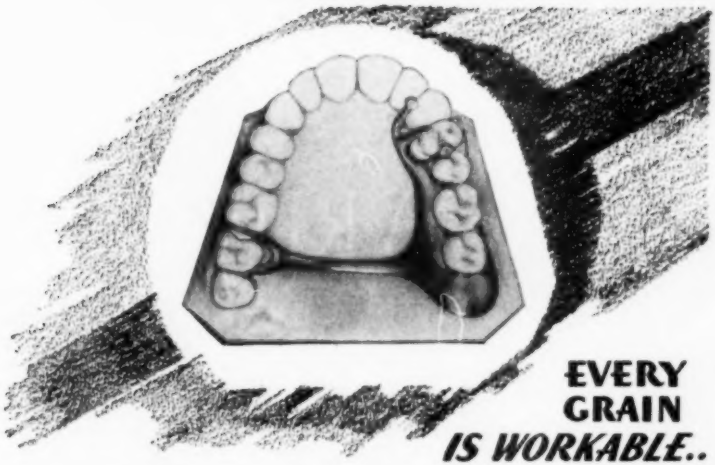

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1. Keefer, C. S., Postgrad. Med. 9:101, Feb. 1951
2. Flippin, H. F., and Israel, H. L., Med. Clin. North Amer. 34:1653, Nov. 1950

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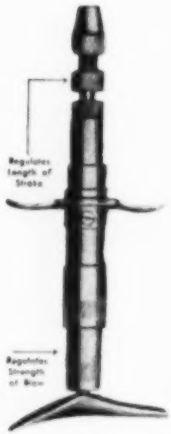

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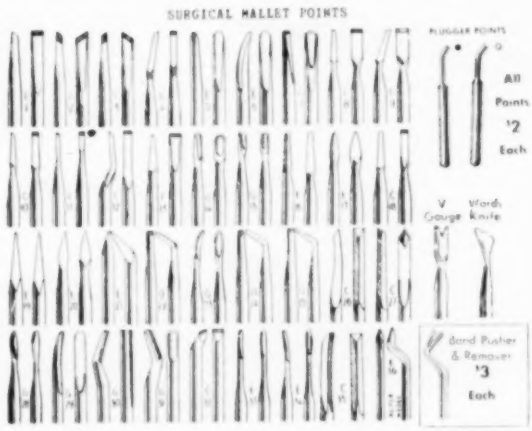

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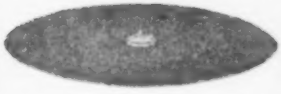

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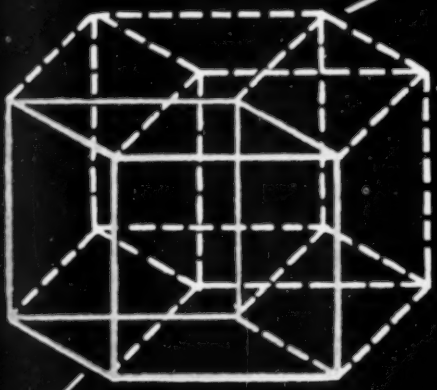

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†Bragdon, C.: *A Primer of Higher Space, New York, Alfred A. Knopf, 1923, Plate 1.*

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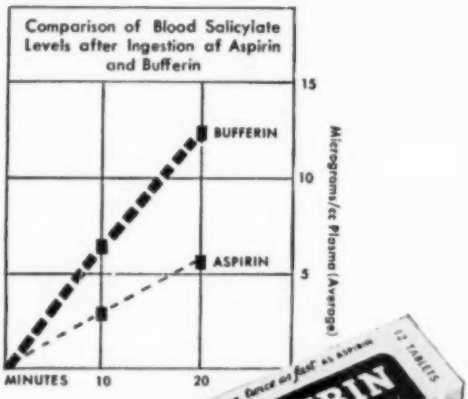

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[1]Dreisbach, M. B. and Handy, E. School lunch management in relation to nutritive value, cost and acceptance of foods served. U.S.D.A. Pa. 114 (Jan.) 1951.
[2]Meyer, F. L., Brown, M. L., and Hathaway, M. L. Nutritive value of school lunches as determined by chemical analyses. J. Am. Diet. Assn. 27:841 (Oct.) 1951.

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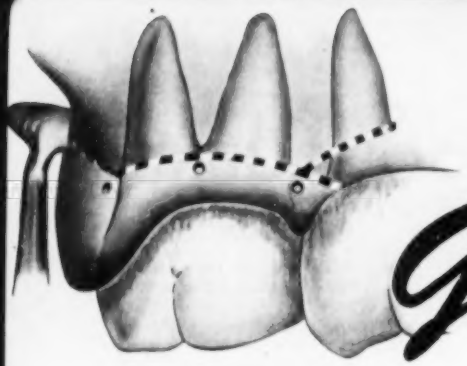

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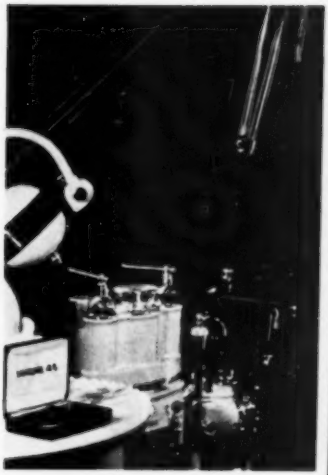

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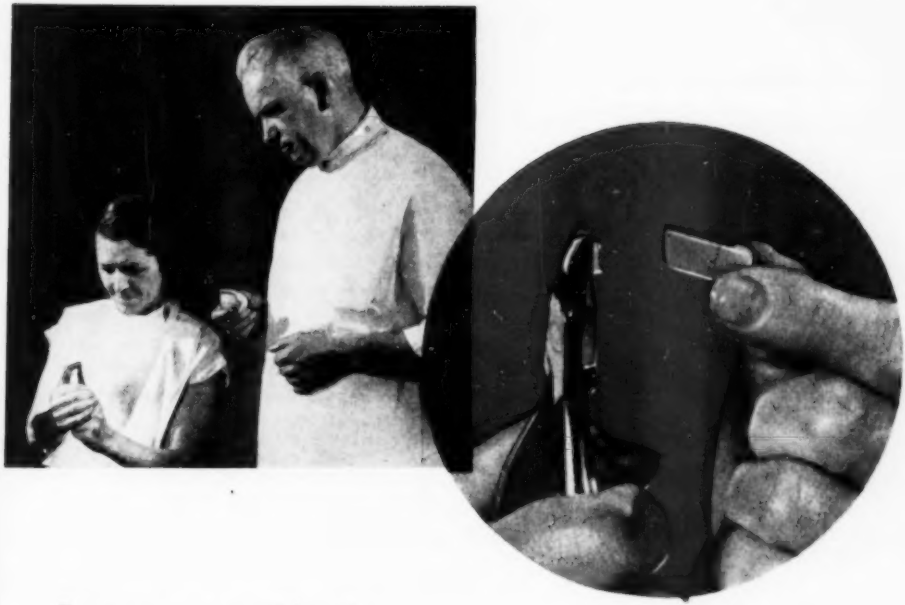

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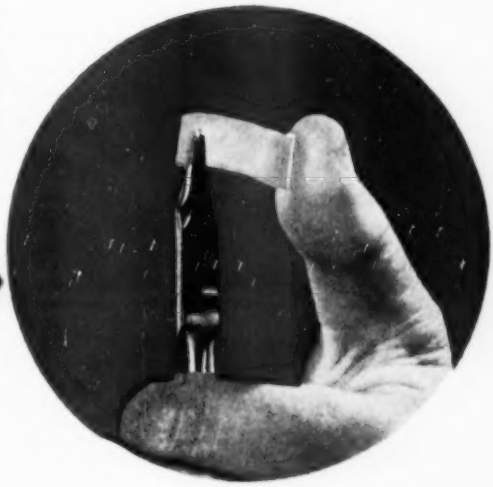

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JANUARY 1953 VOLUME 46 • NUMBER 1

JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

A standardized indirect technic for reversible hydrocolloid

Morris J. Thompson, D.D.S., Beverly Hills, Calif.

The numerous advantages, both economical and technical, of the indirect hydrocolloid technic have induced leading clinicians to adopt, advocate and teach its use. The time which can be saved at the chair by delegating the construction of indirect restorations to the auxiliary staff permits the dentist to see more patients and to devote more attention to the study of their problems. The indirect hydrocolloid technic permits the dentist also to perform an increased amount of dental service, a highly desirable result in view of the increased interest of the public in obtaining more health care.

Models made from hydrocolloid impressions provide detailed and accurate anatomic reproductions of the soft tissue, the teeth and prepared cavities. These reproductions provide the dentist with technical advantages which enable him, in consultation with his technician, to design and to produce prosthetic appliances and restorations which are more serviceable to the patient. The technic can be applied to Class I, II, III, IV and V fillings, to fixed and removable bridges, to full dentures, to repairs and to the rehabilitation of a full complement of teeth to cuspal coordination.

Refined reversible agar material, which makes possible these modern indirect technics, was introduced into dentistry a little more than two decades ago. It was first used for taking impressions for study models and later to produce very acceptable results in partial denture construction. Some time elapsed, however, before advantage was taken of the possibilities of its use in the field of operative dentistry. In 1937 the first article[1] on this type of usage was published.

Presented before the Section on Operative Dentistry combined with the Section on Partial Denture Prosthesis, ninety-second annual session of the American Dental Association, Washington, D. C., October 16, 1951.

Special lecturer, School of Dentistry, University of Southern California, Los Angeles, and teacher, University Extension, Dental Division, University of California.

1. Sears, A. W. Hydrocolloid impression technique for inlays and fixed bridges. D. Dig. 43:230 (May) 1937.

Widespread interest and general acceptance throughout the country did not occur until a thoroughly dependable time and temperature technic was developed to standardize the use of hydrocolloid material. During World War II, dentists who were familiar with this particular technic before they entered the service were instrumental in inspiring further interest in this field.

A STUDY IN THE BEHAVIOR OF HYDROCOLLOID

Conditioning Hydrocolloid • In the author's earlier work in 1938,[2] it was recognized that hydrocolloid had a different viscosity at various temperature levels. At the boiling point hydrocolloid was fluid; when stored at lower temperatures, it was semifluid; when cooled further for the comfort of the patient during the taking of impressions, it became more firm.

Liquefying • It is known that hydrocolloid should be boiled for a period ranging from 8 to 10 minutes to reduce the material to a liquid state. The inconvenience of arranging heating equipment in the dental office and the continual threat of burning or of bursting the package of material prompted the development of a bath in which the temperature is controlled. When it was established that the material would liquefy below 212°F., it appeared desirable to control the temperature at, or just under, the boiling point to prevent the boiling of the water, the consequent bursting of the package and the scorching of both the package and the syringe if all the water were to evaporate.

The equipment was further improved by automatically controlling the temperature of the liquefying bath at approximately 145°F. at the termination of the liquefying period so that the hydrocolloid could be stored and ready for use when needed.

Storage • It is known that hydrocolloid material can be maintained and stored in a fluid state adequate for use at a temperature of 145°F., which is far below its liquefying temperature. For the comfort of the patient and to facilitate handling of the material, it should be stored at a temperature as low as possible yet high enough to produce a material which can be injected and dispensed with ease.

Through trial and error in early work with hydrocolloids, a storage temperature was determined. After World War II, however, materials of improved composition were developed to permit a storage temperature of 138°F., a much lower and more comfortable temperature. In using such a low temperature, great care had to be exercised not to withhold the syringes from the bath for any period longer than absolutely necessary. To provide a little more leeway, a temperature of 145°F. is now suggested as being more practical. No particular harm results in using material at a temperature of 150°F., but it is less comfortable for the patient and the operator.

Tempering • After the hydrocolloid has been injected into the cavity, in most cases a tray filled with additional material is required. Because of the bulk of hydrocolloid in the tray, heat is retained; and the material must be cooled somewhat and tempered to increase its firmness. Although the injected materials and the tray materials are of different temperatures and viscosity, when chilled with water they bond together to form a clean, solid mass, accurately reproducing the cavity.

On the basis of this knowledge of the behavior of hydrocolloid at different temperature levels, a series of 122 tests[2] was undertaken to evaluate further and to standardize the "time and temperature

2. Thompson, M. J. Reversible hydrocolloid impression material: its treatment and use in operative and prosthetic dentistry. J.A.D.A. 39:708 (Dec.) 1949.

technic." The tests varied from testing the accuracy of hydrocolloid when poured around a metal Invar die surrounded by a matrix at 200°F. to tempering the material in a tray at 125°F. for 50 minutes.

A more conclusive and practical series of tests was made[3] with a tempering period varying from 5 to 40 minutes in a bath of 113°F. The results of these tests for dimensional accuracy, definition, detail and sharpness indicated that the most favorable length of time for tempering the material in a tray is from 10 to 20 minutes.

For the present-day materials, temperature levels varying from 102°F. to 115°F. may be selected. As the temperature is reduced, so is the time period for tempering the material. The author is now using 114°F. ± 1°F. for 10 to 20 minutes except with the full tray of material, for which the period is reduced to 15 minutes.

The resultant models made from hydrocolloid material which has been treated at lower temperatures (102°F., 105°F., 110°F.) are relatively accurate. The period for conditioning is more critical, necessitating definite timing and taking the impression at the end of a designated period.

Shrinkage of Hydrocolloid and Expansion of Stone • The accuracy of tests[2] for shrinkage and expansion of the materials used was established by measuring the resultant stone model. Contrary to the result anticipated, the mixture of hydrocal measured with a dial micrometer revealed different expansions under varying conditions. On study of the preliminary tests, it was realized that hydrocolloid also had considerable shrinkage.

The amount of shrinkage of hydrocolloid is rather constant and can be compensated for consistently if the hydrocal used is treated to expand .28 per cent. Therefore, it can be assumed that the hydrocolloid used in these tests was shrinking approximately .28 per cent. Hydrocal mixture, spatulated mechanically under vacuum and squeezed with hand pressure in a towel to remove moisture, develops sufficient expansion along with hygroscopic set to equal the amount of shrinkage.

Accuracy of the Resultant Model • In one series of 25 tests the hydrocolloid material was tempered in a bath of 113°F.; the average expansion of the resultant stone models (measured in two directions) was .005 per cent larger than the original subject (.375 inches diameter). This very slight oversize is so negligible that one can assume that the normal contraction of hydrocolloid was compensated for by the expansion of the stone.

On examining another group of stone models resulting from the use of a tray full of hydrocolloid at a temperature of 107°F. (tempered in a 102°F. bath for 3 minutes), it was found that the average size was .027 per cent larger than the metal peg (.375 inches diameter). For these two series of tests tap water, 72°F., was used for chilling. A further test, using cold water at 42°F. for chilling the hydrocolloid, revealed a slight oversize of .011 per cent. In computing averages, the models were measured in two directions. Extreme diameters, either plus or minus, were included; plus or minus errors appeared with approximately equal frequency.

Recently two group tests (Table 1) were made, using an improved and harder model stone (Fig. 1). In each group the stone was handled differently. In Group A, Table 1, the water-powder ratio of 24:100 was used while in Group B, Table 1, a mixture was placed in a towel and the moisture was squeezed out

3. Thompson, M. J. Hydrocolloid—its treatment and application in securing consistent accurate models for indirect inlays and fixed bridges. Bul. Oklahoma D.A. 38:7 (Oct.) 1949.

with hand pressure sufficient to form a puttylike mass. Each mixture was immersed in 2 per cent potassium sulfate solution for hygroscopic expansion. In both instances the hydrocolloid material was treated and handled in the same manner except for the chilling temperature. In Group A, Table 1, the impressions were chilled with water of 71°F. while in Group B the impressions were chilled with water of 42°F.

It appears from the results with the second group (Table 1, Group B) that the removal of water for a stiffer mix increases the expansion, producing a more accurate model. Furthermore, cold water seems to have no apparent harmful effect.

Preserving the Size of the Impression • In 1940 Paffenbarger[4] demonstrated the instability of the hydrocolloid impression in water. He disclosed also the undesirability of maintaining the impression in air of 100 per cent humidity and 32 per cent relative humidity. Earlier Skinner and Kern[5] and more recently Phillips[6] disclosed the same ill effects. Phillips, in addition, immersed the impression in a 2 per cent potassium sulfate solution, measured the hydrocolloid with a micrometer comparator microscope and found that the impression was undersized.

It is evident from the results of the tests of the author and others[7-9] that

4. Paffenbarger, G. C. Hydrocolloidal impression materials: physical properties and a specification. J.A.D.A. 27:373 (March) 1940.

5. Skinner, Eugene W., and Kern, W. R. Colloidal impression materials. J.A.D.A. & D. Cosmos 25:578 (April) 1938.

6. Phillips, R. W., and Ito, B. Y. Factors influencing the accuracy of reversible hydrocolloid impressions. J.A.D.A. 43:1 (July) 1951.

7. James, A. G. Maintenance of equilibrium in reversible hydrocolloid impressions. I. Made with stock impression materials. J. D. Res. 28:108 (April) 1949.

8. Kendrick, Z. V., Jr. Physical properties of agar type hydrocolloid impression material. J.A.D.A. 40:575 (May) 1950.

9. Thompson, M. J. Factors which affect the size of the resultant stone model made from a hydrocolloid impression. J. South. California D. A. 16:25 (June) 1949.

Table 1 • Degree of accuracy of improved hydrocal models produced from hydrocolloid impressions*

	A†				B‖				
	Tap water 71°F. Chilled 5 minutes. W/p ratio: 24/100				Cold water 40-42°F. Chilled 3 minutes. W/p ratio: No established ratio				
Metal die	Model Size 1‡	Model Size 2§	% Eccentricity	% Maximum error	Metal die	Model Size 1‡	Model Size 2§	% Eccentricity	% Maximum error
0.3750	0.3749	0.3749	.000	.027—	0.3750	0.3752	0.3750	.053	.053+
50	48	47	.027	.053—	50	47	50	.080	.080—
50	52	45	.186	.133—	50	50	49	.027	.027—
50	50	46	.107	.107—	50	42	46	.107	.213—
50	46	44	.053	.160—	50	50	51	.027	.027+
50	48	47	.027	.053—					
50	47	47	.000	.080—					
50	49	47	.053	.080—					
50	49	50	.027	.027—					
50	46	43	.080	.186—					

*Measurements in inches.

†Chilled by drawing water through the tubing of a small inlay tray. Hydrocolloid material tempered at 114°F. for 10 minutes; metal die preheated to 100°F.; tray material scraped, injected with syringe material before impression was taken. Impressions poured after a 3 minute immersion in a 2 per cent solution of potassium sulfate. Impression and hydrocal reimmersed for 1 hour in the same solution for hygroscopic expansion, removed and allowed to dry 24 hours before measurements were taken with a micrometer caliper.

‡Model size 1 measured parallel with tray.

§Model size 2 measured at right angles to tray.

‖Hydrocal vacuum mixed under mechanical spatulation for 30 seconds, then poured into a linen towel and excess moisture removed to make a heavy puttylike mass.

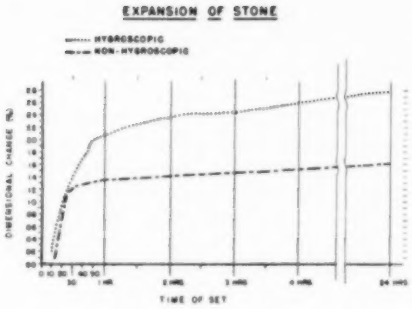


Fig. 1 • Nonhygroscopic curve produced with improved hydrocal having a powder-water ratio of 24 to 100 by weight; hygroscopic curve produced with same hydrocal mixed under vacuum with moisture removed by hand compression in a towel

the immersion of the impression in tap water or in a solution of 2 per cent potassium sulfate for any length of time is detrimental. The testing method used by the author was comparable with the practical use of the hydrocolloid because measurements were made on the stone model.

The tests made by the author included a series in which the impression made with one particular hydrocolloid was removed from the tray and immersed in a solution of potassium sulfate. After immersion from 0 to 22 hours, undersized models resulted. In another test (Fig. 2), a 2 per cent tap water solution of potassium sulfate and a 2 per cent solution made with distilled water had a similarly disturbing effect. In the same series a parallel test was made using the same batch of hydrocolloid but with the impression maintained in a bath of distilled water. The effect was rather surprising. The resultant models, 30 in number, although larger, were nearly the same size for the various test periods as the original model.

Inasmuch as immersion in solutions fails to maintain the size, the impression should be poured with hydrocal as soon as possible. To hasten the surface set of the hydrocal, the impression may be first immersed in a solution of potassium sulfate. This immersion should be limited to approximately 3 minutes, the time consumed in mixing the hydrocal.

Abuses of Hydrocolloid • The hasty reduction of the heat in hydrocolloid by means of drawing water through the tray before placing it in the mouth should be discouraged. When a tray of material of such inconsistency is applied to the teeth and tissue, the material does not adapt itself nor flow evenly. Such an uncontrolled procedure may gel the hydrocolloid and render it inaccurate when a copy of a most critical cavity or tooth is needed.

Allowing the filled tray to cool in air is not recommended either, because the inner portion of the impression material mass takes on a different consistency. Neither does cooling the material in a large metal syringe under running water of an uncontrolled temperature produce accurately fitting restorations. The material is likely to be lumpy and to have a granular texture.

The partial removal of an impression or removal with hesitation may stretch or compress the material beyond its

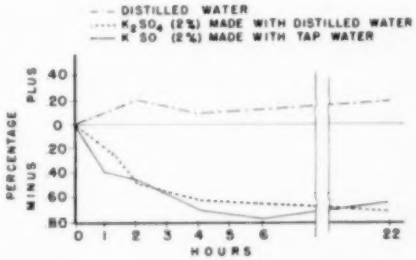


Fig. 2 • Dimensional change resulting from immersing impressions in three different baths. Curves from 90 test impressions; 30 treated in each type of bath. Five of the 30 impressions poured at hourly intervals; measurements computed for an average

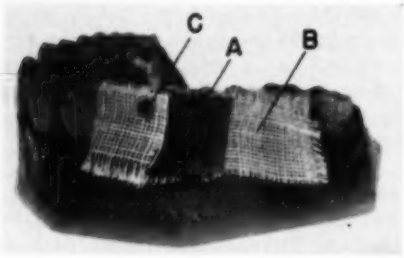


Fig. 3 • Wax and gauze carrier used to make hydrocolloid impression of Class V cavity. Material injected between wax, A, and gauze, B, and over the gauze for retention. Impression stabilized with finger placed either mesial or distal to prepared tooth. Gauze released at C to provide second extended end to facilitate holding impression on vibrating blade while hydrocal mixture is poured

physical limitations.[4] The chilled impression must be removed from the mouth with one quick movement.

There are practitioners who originally used the gel in small quantities, confined in a band, much as is done in the compound or wax technics for taking cavity impressions. The drag of the material over the bulge of the tooth or margin resulted in ill-fitting inlays. This result emphasized the inaccuracy of the band method and proved the necessity of using a larger mass of hydrocolloid such as is provided in a tray.

PRACTICAL APPLICATIONS

Class I and V Cavities • In taking impressions of Class I and V cavities, the ejection of the fluid agar gel presents an advantage over other impression methods. With the injection method it is possible to reach all the sharp angles of box-type cavities without difficulty and to reproduce them accurately. This is especially true in shallow preparations having a minimum of retention.

The method of taking impressions of these cavities has been simplified with the introduction of a wax and gauze carrier (Fig. 3), which is made of medium hard baseplate wax over which a strip of gauze has been placed and tacked at the ends. The gauze functions mechanically in holding the hydrocolloid. After the injection of hydrocolloid between the strip of gauze and the wax and over the gauze (Fig. 3, A and B), the cavity is filled and the carrier of material is pushed into place. The carrier is stabilized against the most convenient mesial or distal tooth. Gelation is achieved by chilling the material with a syringe of cold water.

Pouring this type of impression without error is a rather delicate operation. The impression, with the ends of the gauze placed against a metal blade, is held between two fingers of the operator while hydrocal of a puttylike consistency is vibrated to place.

The impression for an inaccessible cavity of Class V type is easily and accurately made with the material when care is used. The hydrocolloid is first injected into the cavity and then compressed with a strip of gauze. This gauze is imbedded in the hydrocolloid by injecting an additional amount of material over the top. After being chilled, the impression is removed. Not only does the gauze reinforce the elastic material, but the extended ends provide a means of handling.

Before the impression is filled with hydrocal, it is placed on a puddle of soft plaster, which is allowed to set. The impression is then poured in the usual manner. This particular indirect technic is especially adapted for use in U-shaped cavities partly surrounding an isolated tooth.

The Class I cavity impression (box-type) is rather simple to take with the gauze and wax carrier inasmuch as the cavity is generally deeper and more accessible than other types. In extended occlusal preparations involving the restoration of a cusp, a metal inlay tray is required.

Class III Cavity • Although impressions of Class III cavities may be made directly on the tooth with wax, there are many operators who prefer working indirectly on a model when making inlays of this type. The operation of drawing a wax impression lingually from a cavity is tedious and frequently raises a question of doubt as to accuracy. Like other materials, hydrocolloid has limitations in its removal from dovetails and mechanical locks. Its elasticity and flexibility, however, do constitute an advantage over the more rigid impression materials. By virtue of its resilience, the agar material stretches and pulls around sharp angulations and undercuts, provided that the operator uses judgment and skill and respects the limitations of the material.

Accurate impressions of Class III cavities may be made routinely if the interfering locks are reduced or elimi-

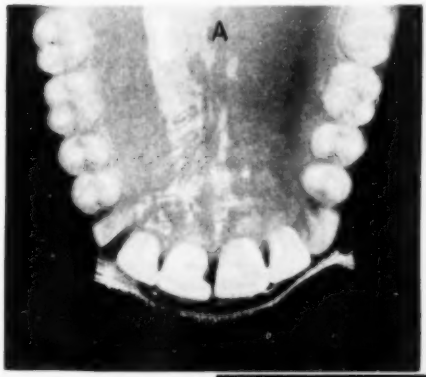
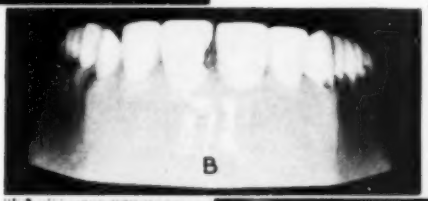
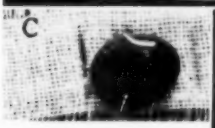
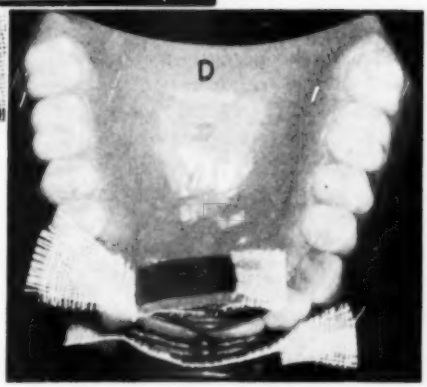


Fig. 4 • Class III impression. A: Labial matrix made of hydrocolloid and gauze to prevent impression material from projecting labially and locking

B: To form core against which labial matrix may be shaped, soft wax is pressed into cavity and slightly past the labial margin







C, D: Impression, D, made by first injecting hydrocolloid into well formed by labial matrix and cavity and then compressing it with a second portion, C, on a wax and gauze carrier

nated. In some instances where there is adequate separation or space, the labial lock may be cut away and the impression removed without distortion. In the more questionable cases, the removal without distortion may be accomplished by the separation of the teeth and the use of a labial matrix (Fig. 4 A). The separation of the teeth is helpful; the matrix is necessary to prevent the material from projecting labially and locking. The matrix is made by injecting hydrocolloid over the surfaces and is keyed by extending the material into the interproximal spaces of several teeth. To reinforce the matrix and to facilitate its handling, a strip of gauze is laid over the first layer and an additional portion of hydrocolloid is ejected over both.

Prior to this operation, a soft, nonsticky wax is pushed into the cavity (Fig. 4 B) from the lingual side to slightly beyond the labial margin. It is then trimmed to within a quarter of a millimeter of the margin and next to the adjacent tooth to reduce the danger of a mechanical lock when the hydrocolloid impression is removed.

The wax is removed from the cavity; and with the labial matrix in position to prevent the material from flowing through, the hydrocolloid is ejected beneath and over the gauze (Fig. 4 C) and into the cavity. The material in the cavity is forced into place with the carrier of hydrocolloid (Fig. 4 D), confined and then chilled with water.

There is no necessity to assemble the labial matrix with the impression. The Class III cavity impression is poured by using the same technic as that used for the Class V; that is, by placing the impression on a vibrating blade, holding the gauze ends with the tips of the fingers and flooding the impression.

To expose all cavity margins of the model for the wax-up, the adjacent tooth must be removed. The interproximal contact is not established on the pattern, but the finished restoration is given anatomical form in the mouth when the teeth are separated.

Repairs •

Bridge Facing • The repair of a fixed bridge necessitated by the fracture or loss of a long pin porcelain facing has always been a dental problem. Today, however, it can be repaired relatively easily with a processed acrylic resin facing (Fig. 5). Hydrocolloid, with its resiliency and versatile application, plays an indisputable role in simplifying the replacement of the facing.

The replacement is handled in a manner comparable with the procedure followed for the Class III impression. The space (Fig. 5 B) previously occupied by the porcelain is filled with a soft wax or stopping; and a matrix of hydrocolloid is made for the lingual surface, extending mesially and distally. A length of gauze (Fig. 5 B, 1) is used in the construction of the matrix to provide reinforcement and a means of handling. It is necessary to extend the stopping slightly past the gold margin (Fig. 5 B, 2). The stopping is removed, and hydrocolloid is injected into this most critical space (Fig. 5 C, D) and chilled. During the process a strip of gauze is laid over the surface and a second portion is added to reinforce the material when it is chilled. Next, the hydrocolloid is removed; and the area around the platinum pin is cut out to form a rectangular groove (Fig. 5 E). A heavy mixture of hydrocal is vibrated over the impression (Fig. 5 F). The wax pattern for the facing is shaped on the model, and the two are placed in a flask (Fig. 5 G). The acrylic resin opposite the head of the platinum pin is grooved for mechanical retention upon cementation (Fig. 5 H).

Partial Denture Abutment • In many instances as a result of caries, a gold inlay supporting a partial denture is lost and must be replaced. This type of repair must be accomplished with a functioning

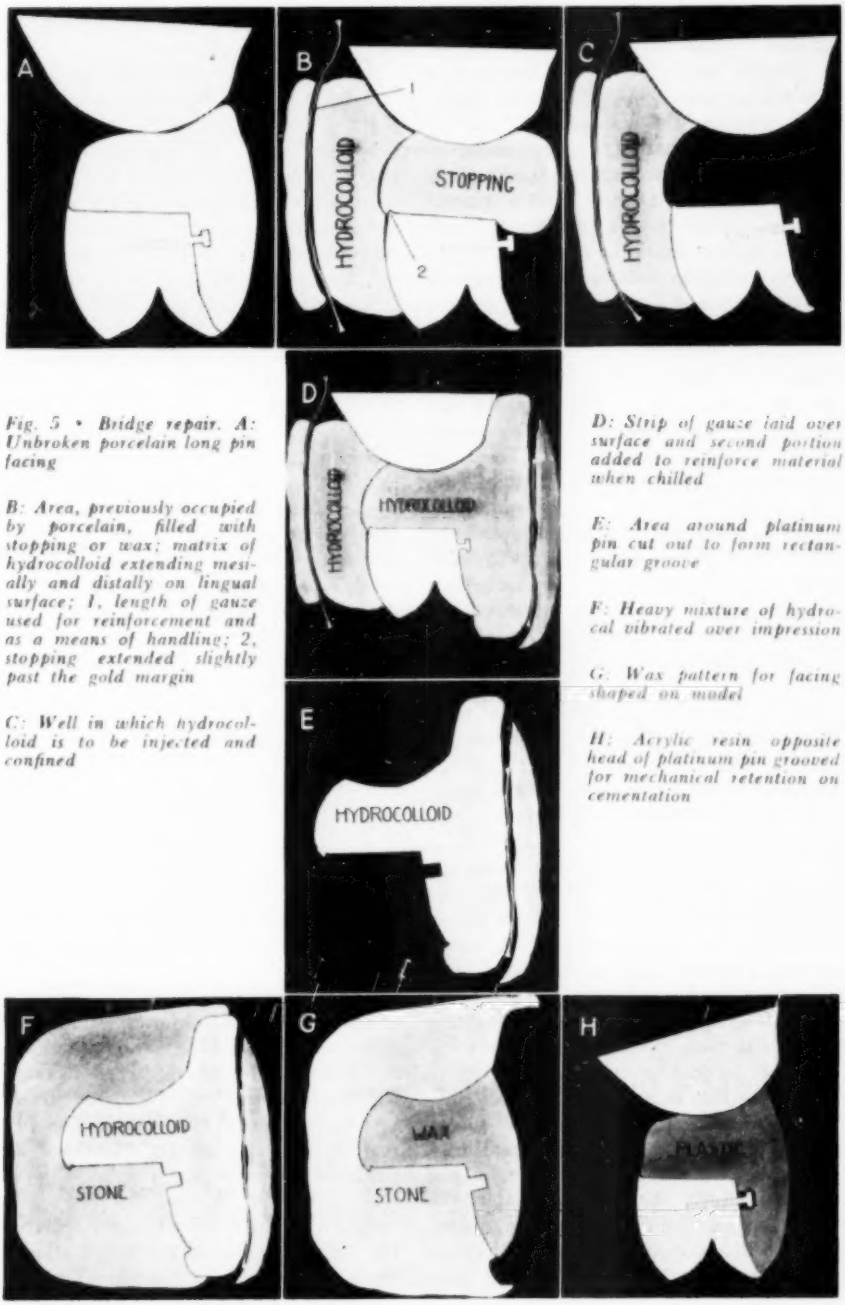


Fig. 5 • Bridge repair. A: Unbroken porcelain long pin facing

B: Area, previously occupied by porcelain, filled with stopping or wax; matrix of hydrocolloid extending mesially and distally on lingual surface; 1, length of gauze used for reinforcement and as a means of handling; 2, stopping extended slightly past the gold margin

C: Well in which hydrocolloid is to be injected and confined

D: Strip of gauze laid over surface and second portion added to reinforce material when chilled

E: Area around platinum pin cut out to form rectangular groove

F: Heavy mixture of hydrocal vibrated over impression

G: Wax pattern for facing shaped on model

H: Acrylic resin opposite head of platinum pin grooved for mechanical retention on cementation

relationship between the inlay and the partial denture (Fig. 6).

In this procedure three impressions are made: one each of the entire opposing arches and one for a single die of the abutment preparation. The impression of the complete arch containing the abutment should be taken with the partial denture in place. In pouring the impression, care should be taken not to lose the relationship between the abutment preparation and the denture.

The exactness of the single die and of the abutment on the master model permits the transfer of the pattern from model to model and facilitates the development of the wax pattern for occlusion and fit beneath the clasp or attachment. The pattern is placed on the single die and is given anatomical form without loss of relationship to the denture or the opposing teeth. On being cast, the abutment should fit accurately on the master model; any necessary adjustment for the attachment should be made at this time.

The Complex Single Restoration • In cases where the contemplated restoration is to cover the greater portion of the occlusal surface, impressions of the upper and lower arches are required.

The Tray • Cavities which, unlike the box-type preparation, will not retain or confine the material require the use of a small inlay impression tray. A water-cooled tray with perforations is preferred. Not only do the holes provide for retention, but they allow the firm material to escape more evenly and with a minimum of by-passing over the margins.

For various reasons wax stops of sufficient thickness and length are placed inside and at each end of the small tray. Primarily, these stops provide a pad against which the tray of material is held securely during the chilling process. The stops also confine the material within the tray and maintain the required space for bulk between the metal tray and the teeth.

In some cases in which the operator is making a particularly difficult complete occlusal restoration with little or no guidance from the adjacent teeth for lingual balance, full mouth trays are required for impressions. Models which permit cuspal guidance on the opposite side are of great help in fabricating a balanced restoration which requires little or no occlusal adjustment in the mouth.

Filling the Tray • The tray is filled by the assistant after the preparation of the cavity in the rough. At this point it is important to extrude the viscid material in a manner which prevents lamination. The material, if conditioned properly, should have a viscosity that allows it to flow smoothly into the tray and to provide a homogeneous mass that retains its position in the tray with a degree of firmness.

Tempering • On filling the tray, the assistant immediately places it in a bath of 114°F. ($\pm 1°$) for 10 to 20 minutes to dissipate the heat and to stiffen the material.

Centric Wax Bite • Before the patient is dismissed, a wax bite is made with any medium-soft wax used for making base plates. The wax sheet is cut into a triangular shape to conform somewhat in width and size to the complete arch. This method allows the patient to bite evenly on both sides and more nearly to a complete centric closure. Usually, the wax bite is laid aside; and the models are articulated with the worn facets of the teeth as guides. Models accurately articulated permit the construction of a restoration requiring little occlusal adjustment at the chair.

Exposing the Cavity Margin • During the tempering period the preparation of the cavity should be completed and the

Fig. 6 • Partial denture abutment repair. Above: Wax pattern removed from model, placed on single die, adjusted to fit dowel attachment, occluded to opposing teeth, contoured and ready for marginal correction. Below: Casting fitted to function with partial denture, polished for cementation

tissue retracted from the cavity margin. Exposing the cavity margin is necessary and may be accomplished mechanically, chemically or surgically (Fig. 7).[10] A practical and expedient mechanical procedure is to tie a single strand of cotton thread (no. 8) around the tooth. The knot may be double; or if made single, sticky wax is used to hold the thread together. The thread is packed into the gingival crevice for a few minutes. In the chemical procedure alum, a styptic, is used in the same manner. Short cotton fibers cut from thread or single strands taken from household twine are impregnated with alum or zinc chloride crystals and placed in the crevice to stop seepage. The thread also displaces the soft tissue. Retraction with alum is slower, but it may be hastened by adding a drop or two of adrenalin chloride (1 per cent) after the fibers have been packed to place. Sloughing is prevented by the use of alum and adrenalin; the operation may be performed with little injury to the tissue. In some cases electric cautery is expedient and necessary to reduce bleeding and to liquefy interfering epithelial tissue.

The Impression • Prior to taking the impression, the tooth is isolated, the cavity dried and all fluid in the gingival crevice removed with blasts of air. Immediately the assistant lifts the tray from the tempering bath; the surface, contaminated with water, is cut away to expose fresh hydrocolloid. This exposure allows a complete bonding of the two materials.

Rubber tubing is then attached to the tray; simultaneously, the operator removes the small syringe from the storage bath and before ejecting wipes the needle free from water. He then expels the questionable material in the needle onto an area away from the preparation (Fig. 8, left); with a continuous flow, the material is forced ahead of the needle along the floor of the crevice to avoid trapping air. After the injection of material into the critical gingival area, the preparation is covered to include all other margins (Fig. 8, center); and without hesitation the tray of material is pushed gently to place (Fig. 8, right). Before the tray is seated completely, a comfortable position is assumed by the operator to permit him

10. Thompson, M. J. Exposing the cavity margin for hydrocolloid impressions. J. South. California D. A. 19:17 (Feb.) 1951.

Fig. 7 • Exposing cavity margin. Left: Mechanical: thread tied around tooth and tucked into crevice. Center: Chemical: short cotton fibers impregnated with alum or zinc chloride crystals placed in crevice to stop seepage. Right: Surgical: electric cautery used in some cases to reduce bleeding and to liquefy interfering epithelial tissue

to maintain a continuous and steady pressure in one direction during the chilling process.

After gelation the impression is removed quickly with the fingers placed directly on the material to prevent the separation of the tray from the impression. Before the impression is examined, it is washed under the tap to remove saliva and then freed of all water with blasts of air. The impression to be acceptable should show readily clean-cut, sharp margins. It is then placed in a solution of 2 per cent potassium sulfate, and the stone is prepared for immediate pouring.

Master Model and Single Die • Before the pouring is begun, the solution in the impression is removed with blasts of air; care is taken to avoid drying the hydrocolloid completely. The cavity area is poured first; and when it has hardened, the model is removed and the second pour is made for the master model. After the model for the single die is removed, it is shaped up with a model trimmer and then laid aside to dry. Before the wax pattern is made, that portion of the single die next to the margin is trimmed with a knife, bur or stone to provide an unobstructed view for condensing and perfecting the marginal fit of the wax pattern.

In order to secure smooth, dense, hard dies and the necessary expansion, the hydrocal mixture should be spatulated under vacuum and placed in a towel; sufficient moisture should be removed with hand pressure to develop a puttylike consistency. To eliminate the re-forming of air voids in the mixture, especially for the single die, small amounts are cut from the mass with a sharp instrument, placed on the side of the impression and gently vibrated to place.

Master models frequently show discrepancies at the gingival area, the result of fracturing the finlike gingival projections in the removal of the first pour. When the contact and occlusal surface are adjusted, such discrepancies may be removed with a bur or knife to allow the seating of the wax pattern or inlay.

Treatment of the Model • A good lubricant for a wax-separating medium should be sufficiently fluid to produce a thin film when applied with a small brush. It should not disintegrate the sharp margins of the model during extended immersion periods. The very fine marginal crest, having exposure on two sides, may crumble when exposed to harmful lubricants. As a precaution the separating fluid should be applied just prior to the application of the warm inlay wax.

Wax Pattern • Wax is carried to the model in a fluid state with a warm instrument and adapted to the model with finger pressure. After the pattern matrix is developed, it is transferred to the master model for formation of the occlusal surface and contact points. For convenience and expediency the occlusal surface is built up in segments, one cusp at a time; and the occlusal facets are formed by closing the articulator.

At the completion of the pattern in the rough, it is transferred to the single die for carving the anatomical form and supplemental ridges. Talcum powder is dusted across the pattern to aid vision in carving the pattern and locating the occluding facets.

Considerable time is saved in adjusting the contact points by adding a very small amount of wax to the previously established contact area with a hot instrument. The pattern is lifted from the single die; and just after it congeals to the semiplastic state, it is pushed to place on the master model. The resilient wax is compressed; on removal of the pattern, it springs back to provide the larger contact needed for polishing and final adjustment in the patient's mouth.

Finishing the Gold Casting • After the pickling of the casting, all nodules are

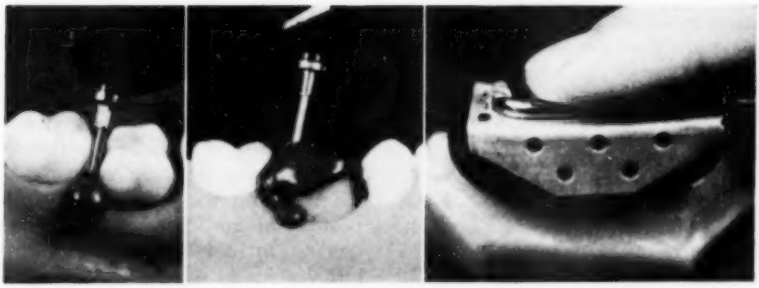


Fig. 8 • Steps in making a good hydrocolloid impression. Left: Hydrocolloid ejected from needle outside cavity to assure a material free from contamination. Center: Hydrocolloid injected into crevice with continuous flow of material ahead of needle to avoid trapping air; cavity filled without interruption. Right: Tray of conditioned material pushed to place without hesitation and held firmly

removed. The contact points are adjusted, and the inlay is fitted on the master model. The occlusion is corrected, supplemental grooves and ridges are recarved with an inverted cone bur; and the entire inlay is polished to within 1 mm. of the margin. The fine, paperlike margin is burnished on the tooth with a round-edge instrument or with a revolving stone; and the inlay is cemented to place. The final polishing is done after cementation.

Plastic Jacket Crown • For esthetic reasons, special consideration must be given to the preparation and impression for the jacket crown. In order to conceal the cement line, the shoulder must be carried sufficiently below the gingival crest to allow for shrinkage caused by retraction or recession.

Foremost in the operator's mind should be the necessity of exposing the shoulder margin to obtain an accurate hydrocolloid impression. For a completely satisfactory result, the tissue should be retracted without destruction to the gingival tissue. This is best accomplished with a pack of cotton fibers which have been impregnated with alum as previously described.

Impression • After all margins of the preparation are clearly exposed, the impression for the jacket crown is made in much the same manner as other crown preparations except that full trays are used routinely for both upper and lower impressions.

Models • The impression bearing the cavity preparation is poured twice, the first model for the single die. In fabricating the jacket, a third model with one adjacent tooth is required for adjusting one of the contact points. It is far easier to spot-in either the mesial or distal contact, one at a time, on a model with only one adjacent tooth. The second contact is made on the master model. This technic is applied to either the porcelain or plastic jacket crown. The single die is duplicated twice: one die is used for the working model and the other for processing the jacket. The first or original die is laid aside as a reference model if needed.

Dwight and Rubin[11] developed a technic for copperplating hydrocolloid. Their success depended on a chemical which hastened the deposition of copper in

11. Dwight, O. D. Copper plating of reversible hydrocolloid impressions. J. D. Res. 28:456 (Oct.) 1949.

sufficient quantity before the hydrocolloid changed in dimension to make it acceptable for a metal die. During their research on the subject, they discovered another more practical method of making a hard die. The model, although not as hard as the copper die, permitted swedging of a platinum matrix in the construction of a porcelain jacket or inlay. This hard die material is made of powder and water, mixed to puttylike consistency and vibrated into the impression. The material requires a hardening period of 30 minutes; in setting behavior it is similar to hydrocal. After the model has hardened, it is removed, trimmed and then baked in an oven of 1,200°F. for 8 minutes.

Fabricating the Crown • The pattern for the plastic jacket is completed to its full contour and anatomical form (Fig. 9 A) with contacts larger than required. Before processing and after a gold-bearing surface is sealed to place, it is transferred to a duplicate stone die which has been covered with tin foil. To maintain the position of the incisal edge and the occluding lingual surface, the pattern is relieved inside by the amount displaced by the tin foil.

In order to secure an accurate marginal fit and a lifelike texture, the processing of the jacket is done by the injection method. In flasking, the injection sprue is attached to the lingual surface, either mesial or distal; and the labial surface

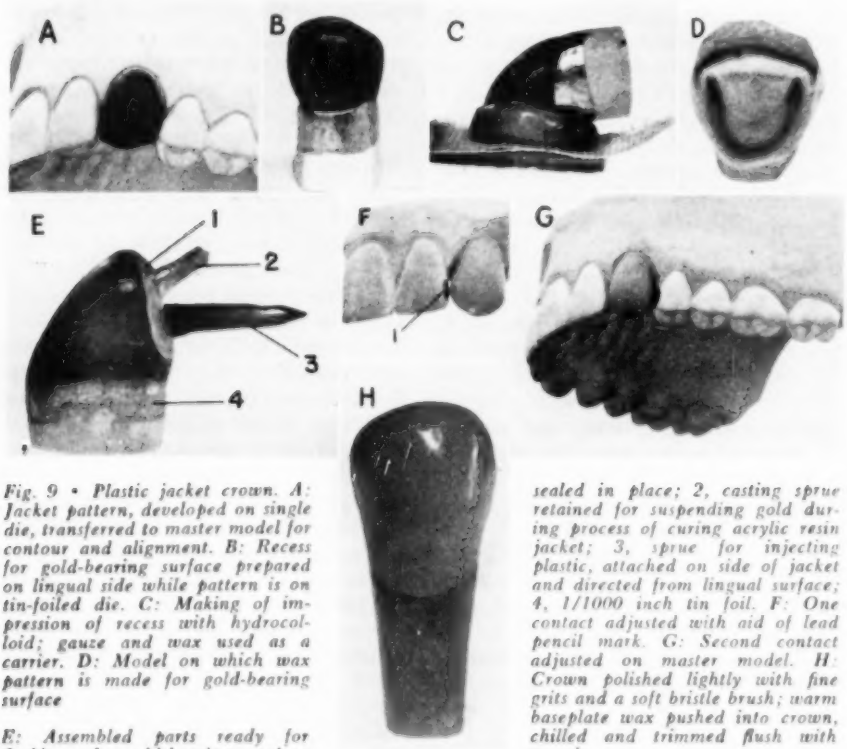


Fig. 9 • Plastic jacket crown. A: Jacket pattern, developed on single die, transferred to master model for contour and alignment. B: Recess for gold-bearing surface prepared on lingual side while pattern is on tin-foiled die. C: Making of impression of recess with hydrocolloid; gauze and wax used as a carrier. D: Model on which wax pattern is made for gold-bearing surface

E: Assembled parts ready for flasking: 1, gold-bearing surface sealed in place; 2, casting sprue retained for suspending gold during process of curing acrylic resin jacket; 3, sprue for injecting plastic, attached on side of jacket and directed from lingual surface; 4, 1/1000 inch tin foil. F: One contact adjusted with aid of lead pencil mark. G: Second contact adjusted on master model. H: Crown polished lightly with fine grits and a soft bristle brush; warm baseplate wax pushed into crown, chilled and trimmed flush with margin

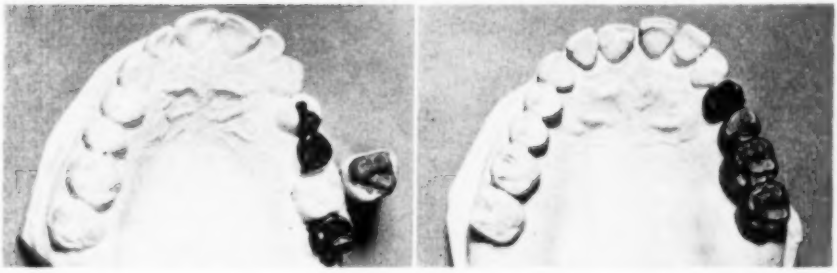


Fig. 10 • Multiple restorations. Left: Solid master model which makes it possible for several inlays to be seated at second sitting and for contacts and occlusions to be adjusted more accurately. Right: Bridge completed in two visits by use of standardized hydrocolloid technic

is exposed to the division of the flask. To allow for enamel color, a second "top" is poured and made available.

To prevent wear, gold is placed on the lingual side of the plastic jacket. In its development, the lingual side of the jacket pattern is recessed (Fig. 9 B) to hold an island of gold and then copied with hydrocolloid (Fig. 9 C). Hydrocolloid is injected under and over the gauze of the wax and gauze carrier, the recess is filled and the carrier of material is pushed to place and chilled. A model is made from this impression (Fig. 9 D). The pattern is then developed and transferred to the articulated model for occlusal correction with the aid of talcum powder. After the casting is made, the gold is seated in place; a portion of the sprue is allowed to project for retention in the flask during the processing of the acrylic resin (Fig. 9 E).

Finishing • Upon the removal of the jacket from the flask, it is cleaned and fitted to the no. 2 single die. The contacts are adjusted on the models (Fig. 9 F and G) one at a time; the general contour is shaped to anatomic form with a diamond stone and trimmed flush with the shoulder of the no. 2 die.

The undulated and stippled effects representing the surface of the natural tooth are best produced with a dull round bur; the surface is polished with pumice and finished with chalk or a comparable grit on a soft bristle prophylactic brush.

In polishing the jacket, the margin is protected with hard baseplate wax (Fig. 9 H). Warm wax is rolled into a cone and pushed into the jacket after it is moistened. It is then chilled and trimmed flush with the margin by stroking a lance along the surface of the jacket down and onto the wax stem.

In polishing, a light touch is most effective; if a wet polishing grit is used, the wax remains unaffected and protects the delicate margin.

Multiple Restorations • Multiple restorations, including inlays, jackets, crowns, bridges and partial dentures, can be made and seated at the visit following the taking of the impression (Fig. 10).

When several teeth in a quadrant of the mouth are operated on, the standardized indirect technic is most applicable. The dentist unfamiliar with the many advantages of this particular procedure, on the patient's account, may object to the lengthy and tedious task it entails. The majority of patients, however, have no objection to this method and frequently encourage its use.

In many instances the two-visit technic cannot be followed primarily because the gingival tissue must be cleared from the

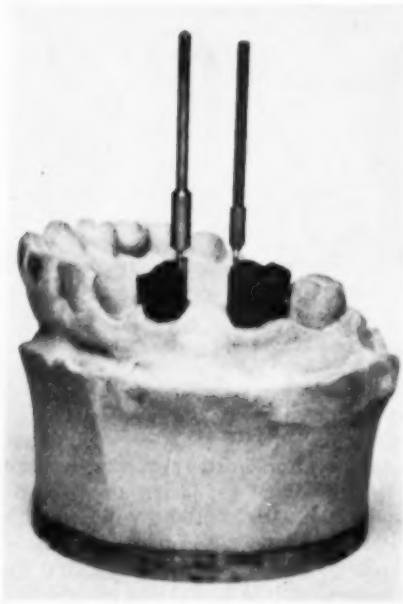


Fig. 11 • Precision removable bridge. Wax patterns with attachment sleeves and parallelometer mandrels in position

cavity margin. In such cases radical or extended procedures for exposing the outline of the cavity have to be instituted, so that an extra visit is necessary.

Partial Dentures • Partial dentures have been made from stone models since the introduction of hydrocolloid material. Relatively speaking, this was a real innovation, for the elastic impression material replaced compound or plaster used for sectional impressions.

Hydrocolloid continues to be the most accurate material for this type of work; however, in areas where there is a great mass of material and where shrinkage is uneven and not compensated by the expansion of stone, inaccuracies appear. This is especially true in maxillary cases where the bar crosses the palate. This inaccuracy can be overcome if a special tray is made to carry the hydrocolloid to the mouth. For ready conductivity of temperature, this tray is made of metal and includes tubing for the transmission of water. For retention, holes are constructed and the inside surface is painted with a thin plaster wash. The tray should fit reasonably close (1/16 inch to 1/8 inch) to the palate. A greater bulk of hydrocolloid is necessary if the undercuts are severe in order to allow the impression to be removed without distortion.

The custom-made tray is required when accuracy is desired and when the complete construction of the partial denture is to be made from the master model.

Precision Removable Bridges • The impression and models are made and articulated in the same manner as the fixed bridge except that the impression for the arch containing the prepared teeth is made in the special tray.

If the indirect technic with its known accuracy is employed, the bridge can be completed entirely with the use of stone models. Some dentists, however, prefer to adjust the abutment castings in the mouth and to take new impressions. When following this procedure, the dentist usually pours low-fusing die alloy into the casting after it has been relieved by painting the inside with rouge dissolved in chloroform. With this metal support, the model is sturdy and yet the inlay can be removed and replaced. The author uses stone models; as a precaution against fracture, duplicate models are made in some instances.

The wax-up of the pattern is done in the usual manner except that a recess is carved to permit locating the female attachment. The precision female sleeve members for the two abutments are located within the contour of the patterns when possible. With a paralleling instrument for alignment (Fig. 11), they are waxed in place completely except on the sides where one or two small fingerlike

projections are extended to maintain the sleeve in position while the gold is cast. The uncast portion is built up with solder and contoured. The casting of this small amount of gold around the sleeves minimizes warpage and, when done successfully, expedites the fitting of the male member. Warpage and melting of the sleeve are practically eliminated by casting into a mold of about 900°F., a temperature as low as possible and yet sufficient to melt the gold and to produce sharp inlay margins. After the castings are contoured and finished, they are placed on the stone model. The model is solid and made without removable dies to assure accuracy of fit in the mouth. Like other restorations, the precision bridge may be seated at the second visit.

Advantages to the Dentist • To the dentist the advantages of using hydrocolloid are innumerable. The author recently mailed a questionnaire (Table 2) to over 1,000 dentists throughout the United States and in several foreign countries who were known to be using the hydrocolloid indirect technic. Eighty-eight per cent of the 895 questionnaires which were returned indicated that dentistry required less physical effort if the hydrocolloid indirect technic was used while 95 per cent stated that dentistry was easier. From the viewpoint of public interest, it is significant that 89 per cent of the dentists reported that their dentistry had improved.

Well worth noting is the fact that these 895 returns came from men of varied experience, ranging from recent graduates to dentists who had practiced for periods from one to over 50 years. The merit of the technic is brought out clearly by the fact that men of all ages have adopted it and are using it daily.

Fifty-seven per cent of the dentists responding were willing to express the opinion that their gross income had increased largely because of increased efficiency attributable to the technic. Those who were able to estimate the amount of this increase conjectured that the increase ranged from 5 per cent to 100 per cent.

It was apparent in evaluating the returns from the questionnaire that the men who employed a technician in their offices not only rendered better professional service but showed substantial economic gains. Many reports, however, showed that conscientious men doing

Table 2 • Response to questionnaire*

Question	Answer
1. Do you use the hydrocolloid conditioner and accessories?	Yes—94%
2. Do you use the accessories only?	Yes—6%
3. How long have you been using hydrocolloid for inlays?	1-6 years 63% 6-12 years 33%
4. If you have discontinued its use, kindly state your reason.	12 discontinued its use. Sample reasons: lack of instruction, used few gold restorations; no assistance in office.
5. Do you depend on your models completely for the construction of your inlays?	Inlays Yes—82% Bridgework Yes—63%
6. Has your dentistry improved since you have been using the hydrocolloid indirect procedure?	Yes—89% No—7%
7. Has your gross income increased since you have been using hydrocolloid?	Yes—57%
If so, what percentage of your gross is an increase?	From 5% to 100%
8. Is dentistry easier for you when using the hydrocolloid indirect method?	Yes—95%
9. Do you put forth less physical effort in your restorative work with the use of hydrocolloid?	Yes—88%
10. Do you do your own laboratory work?	Yes—75%
Do you employ a laboratory technician?	Yes—30%
Is there a commercial laboratory in your vicinity available and willing to render service of this type?	Yes—64%
11. How many years have you practiced dentistry?	From 0 to 50 years

*Percentages figured on 895 returns.

their own laboratory work and using the modern technics described in this article were also successful in obtaining similar results.

CONCLUSIONS

It is natural for the dentist unfamiliar with a standardized hydrocolloid indirect technic to view with skepticism the glowing reports of the ease of application and the marvelous results to be obtained with hydrocolloid as an impression medium. The accuracy of the fit of the inlay and of other restorations and the minimum of adjustment needed at the chair seem incredible. Most important, the general public benefits from the better dentistry which results when the dentist and technician are free to follow a plan of fabrication without interruption from the patient and with complete accessibility to all critical areas. The indirect technic, designed to make dentistry more agreeable and less tedious, is another step forward, which allows the dentist to anticipate extended years of practice with less fatigue, more pleasure and better dentistry.

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Practical management of occlusal dysfunctions in periodontal therapy

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To be of universal practical importance dental procedures must be (1) of demonstrated value; (2) capable of execution by the majority of dentists; (3) expeditious enough for utilization whenever indicated, and (4) within the financial reach of a majority of patients. Unless a dental procedure meets these criteria, it cannot have extensive practical value. Some of the technics developed in recent years fail to meet one or more of these criteria and therefore have only limited application to the total dental population.

PERIODONTICS

The field of periodontics has grown rapidly during the past quarter century. The development of clinical periodontics to its present status would not have been possible if either dentists or patients had found the results of treatment generally disappointing. All of the possibilities which periodontal therapy has to offer, however, have not been recognized sufficiently. The interrelationship of restorative and periodontal procedures has been discussed in a previous publication.[1]

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1. Thomas, B. O. A. The relationship of operative procedures to the health of the periodontal tissues. J.A.D.A. 39:522 (Nov.) 1949.

As already mentioned, some of the technics developed in recent years apparently fail to meet the criteria necessary for a dental procedure which is to be of general practical value. The remainder of this paper will be devoted to a discussion of one such technic; namely, the clinical study and treatment of occlusal dysfunctions. Such dysfunctions often exist in the natural human dentition and an analysis of occlusal function is a necessity in every dental examination. This discussion will center around the analysis of the dysfunctions and the choice of treatment for various cases.

MAXILLOMANDIBULAR RELATIONS

The work of many investigators, beginning with Wallisch[2] and including the relatively recent investigations of Niswonger,[3] Brodie,[4] Thompson[5-7] and Bowman[8] has emphasized the basic importance of the maxillomandibular relationship, irrespective of the teeth. Harmony between rest position, centric relation and centric occlusion is essential if traumatogenic occlusal forces are to be avoided. Overstress in the periodontium may occur otherwise, with inflammation and resorption of supporting tissues. General agreement has not been reached as to the exact part played by occlusal dysfunction in the production or aggravation of periodontal disease. It has been accepted rather generally, however, that disharmonies between centric relation and centric occlusion can lead to traumatic changes in the periodontium and also in the temporomandibular articulation.

MAXILLOMANDIBULAR TOOTH RELATIONS

To understand the possibilities for eliminating interferences with normal functional cusp relations of the maxillary and mandibular teeth, it is essential that the way in which teeth come into occlusion be understood as well as the relationship between the teeth and the supporting tissues, especially the jaws in which they are embedded. It has been demonstrated by Brodie[4] that the position of the mandible is determined early in life and that only the musculature can determine the position of the lower jaw. Thompson[5-7] has emphasized this fact repeatedly in his discussions of centric relation, rest position and centric occlusion. In rest position the opposing teeth are out of contact, separated by an average of two to three millimeters. Centric relation refers to a positional relationship of the mandible to the skull. Centric occlusion is the relationship of the mandible to the skull when the teeth are intercuspated. If the closing pathway of the mandible from rest position to centric occlusion follows the simple hinge axis without deviation in any direction, occlusal interference is not present. On the other hand, any interference with this normal closing pathway of the mandible indicates a premature contact in centric relation which must be eliminated before analysis is made of tooth relationships during the various mandibular excursions.

USE OF MOUNTED STUDY CASTS

Many of the publications during the past several years have stressed the impor-

2. Wallisch, W. Das Kiefergelenk. Archiv. fur Anatomie und Physiologie, Anatomische Abteilung 30: 303, 1906.

3. Niswonger, M. E. Rest position of mandible and centric relation. J.A.D.A. 21:1572 (Sept.) 1934.

4. Brodie, A. G. On the growth pattern of the human head from the third month to the eighth year of life. Am. J. Anat. 68:209 (March) 1941.

5. Thompson, J. R. The constancy of the position of the mandible and its influence on prosthetic restorations. Illinois D. J. 12:242 (June) 1943.

6. Thompson, J. R. The rest position of the mandible and its significance to dental science. J.A.D.A. 33:151 (Feb.) 1946.

7. Thompson, J. R., and Craddock, F. W. Functional analysis of occlusion. J.A.D.A. 39:404 (Oct.) 1949.

8. Bowman, V. R. A roentgenographic study of the movements of the mandible from the physiological rest position to occlusion. Graduate thesis, Northwestern University School of Dentistry, Chicago, 1948.

tance of using mounted study casts and a fully adjustable articulator for the analysis of occlusal relationships where occlusal dysfunctions are noted or suspected.[3,6,9-12] There are many problems associated with the accurate transference of models to the so-called anatomical articulator. Also the time and expense involved in these procedures must be considered. The use of mounted study models has been demonstrated to be of value, however, and therefore meets the first criterion mentioned.

A dentist must acquire a thorough knowledge of the technics and the armamentarium if he hopes to develop speed and precision in mounting models which will be an aid in the analysis of occlusal dysfunctions. Some of the technics may fail to meet some of the criteria mentioned—namely, universality, expeditiousness and economy. A question arises, therefore, as to whether utilization of mounted study casts in the analysis of occlusal dysfunctions is destined to become a routine procedure.

There is no doubt but that in some cases of occlusal dysfunction the use of mounted study casts is essential. In cases where direct examination of the patient leads only to the suspicion that an abnormality exists, properly mounted casts will prove whether the suspected interference actually is present. It may be that with further study and analysis, rules can be formulated whereby cases of occlusal dysfunction which require the use of mounted study casts can be recognized clinically by certain signs or symptoms.

CLINICAL PROBLEMS IN SELECTIVE OCCLUSAL GRINDING

There are many questions which arise when a discussion of occlusal disharmonies takes place. There is general agreement as to the indications for selective grinding of the teeth. It is well known that there are limitations to what can be accomplished in occlusal equilibration by selective grinding. If a patient has a correct centric occlusion, selective grinding usually can be employed to correct premature contacts in the functional (working), nonfunctional (nonworking) and centric bite relationships. When centric relation and centric occlusion are not in harmony, splints, occlusal reconstruction or orthodontic treatment, alone or in combination, must be utilized in conjunction with selective grinding.

When is the proper time for occlusal equilibration? The dentist should not be misled by temporary mandibular displacement which may result from the patient's efforts to assist, or from inflammation, tumors, subluxations, and so forth, in the temporomandibular joint region. The latter cases may require the use of an occlusal splint until the more acute joint symptoms subside. Occlusal analysis and necessary treatment can then be carried out. Any necessary equilibration should be done prior to restorative procedures which involve tooth contours.

In instances where occlusal disharmonies have not produced clinical or roentgenographic evidence of trauma, it is wise to correct the disharmonies before such evidence is produced. Where periodontal pathology does exist in association with occlusal dysfunction, the traumatogenic occlusal factors should be eliminated as promptly as possible.

Should selective grinding be done during orthodontic treatment? The anatomy of the teeth may be such that limited selective grinding is necessary before

9. Miller, S. C. Textbook of periodontia, ed. 3. Philadelphia, Blakiston Co., 1950. Ch. 11.

10. McLean, D. W. Pathologic occlusion: a major clinical problem. J.A.D.A. 31:1587 (Dec.) 1944.

11. Schuyler, C. H. Fundamental principles in the correction of occlusal disharmony, natural and artificial. J.A.D.A. 22:1193 (July) 1935.

12. Schuyler, C. H. Correction of occlusal disharmony of the natural dentition. New York D.J. 13:445 (Oct.) 1947.

satisfactory intercuspation and retention of the teeth can be achieved. This may become evident as the orthodontic treatment progresses, and when this occurs, selective grinding is indicated.

If selective grinding is necessary after the completion of orthodontic treatment, a question arises as to whether the case was properly treated. As mentioned before, differences of tooth anatomy may make it impossible, no matter how long or well an orthodontic case is treated, to achieve a truly satisfactory result without recontouring certain tooth surfaces by means of limited selective grinding. This should be a more common practice than it is at the present time.

The completion of occlusal equilibration is, of course, dependent on numerous factors, not the least of which is the knowledge and understanding of the operator. Six different dentists might have six different ideas as to where the grinding should cease in a particular case. Nevertheless, a few simple rules should be kept in mind as guides in arriving at a satisfactory result in cases where selective grinding is indicated. These steps have been outlined by Schuyler:[11] (1) Premature contacts in centric position, both anterior and posterior, should be corrected. (2) Premature contacts of nonfunctioning teeth on both sides must be corrected. (3) Premature contacts of functioning teeth on both sides must be corrected, anteriorly and posteriorly. (4) Nonfunctioning inclines of the teeth should be checked and any new premature contacts reduced. (5) Premature contacts in posterior teeth in protrusive occlusion should be corrected and the protrusive stress should be distributed over as many anterior teeth as possible.

When premature contacts and excessive occlusal forces have been eliminated from individual teeth and stresses have been distributed over as many teeth as possible, the task of selective grinding is completed. This often requires that the patient make several visits because extreme care is necessary at all times. It is easier to remove tooth structure by grinding than to replace it by restorative means.

CLASSIFICATION AND TREATMENT OF OCCLUSAL DYSFUNCTIONS

Following is a simple classification of occlusal dysfunctions with plan of treatment.

1. Condyle displaced from normal position (centric) because of premature contacts or abnormal positioning of the teeth; corrected by:

Bite splint, to allow repositioning of the mandible to normal relationships.

Orthodontic movement of teeth.

Occlusal reconstruction procedures.

Selective grinding—this is only indicated where the displacement is of minor degree. This requires the use of mounted casts when the premature contact areas cannot be determined otherwise.

2. Premature contact of posterior teeth in centric relation; corrected by selective grinding. When this condition exists, it may require accurately mounted casts to view satisfactorily the relation of cusps to fossa in centric position and in lateral excursions.

3. Premature contact of anterior teeth in centric relation; corrected by selective grinding which can be done readily without resorting to mounted study casts. Accurate information can be gained from the use of bite waxes and articulating paper in studying the problem.

4. Cuspal interferences during mandibular excursions:

Nonfunctioning (nonworking) side; corrected by selective grinding, using articulating paper, bite waxes and other aids. For complete information regarding intercuspation, especially on the lingual side, in all excursions, mounted study casts are essential in many, but not all, cases.

Functioning (working) side; corrected by selective grinding. In some instances mounted casts are necessary to ascertain lingual cusp interferences on the functioning and also on the nonfunctioning sides. As closer intercuspation occurs, it becomes more difficult to be sure of interferences by means of wax bites and articulating paper records. When only the buccal cusps of the upper posterior teeth and the lingual slopes of the upper anterior teeth are in abnormal contact with their antagonists, mounted casts are not essential.

5. Protrusive interferences:

In anterior teeth, a distribution of stresses over several teeth is desirable when possible. This is accomplished by selective grinding of the incisal portion of the maxillary anterior teeth. Where grinding of the mandibular anterior teeth is required, this should include only tissue incisal to the most cervically located points of contact in centric occlusion. These teeth must not be taken out of contact in centric position.

It is not essential to have balance, or even contact, on the posterior teeth when the jaw is in the protrusive position. If it exists, the posterior teeth should not be relieved unless they are in excessive contact. When open bite exists, the anterior teeth should not be brought into contact by grinding of the posterior teeth unless posterior interference is limited to only a few minor contacts.

Overclosure, with deep anterior overbite; corrected by occlusal splints, separately or combined with orthodontic procedures which take advantage of the continuous eruption of the teeth, or by occlusal reconstruction, using inlays, onlays, crowns, bridges and so forth.

The foregoing outline indicates that only a portion of the occlusal dysfunctions are amenable to correction by selective grinding. It is true, however, that the majority of cases seen in routine dental practice can be considerably improved by rather limited removal of interfering tooth structure. The equilibration of forces throughout the natural dentition is an important aid in extending the life span of the individual teeth.

SELECTIVE GRINDING

Following are specific directions for selective grinding which are modifications of methods described by Schuyler.[11,12]

1. Premature contact of anterior teeth in centric occlusion.

Premature contacts in anterior teeth in centric occlusion are detected by placing a finger lightly on the labial surface of the upper anterior teeth and having the patient bring the teeth together in centric occlusion several times in succession. If a premature contact exists, the upper anterior teeth will be felt to move. When this is true, the points of interference of the labial incisal surface of the lower anterior teeth should be reduced.

2. Interferences of anterior teeth in lateral excursions.

If the upper anterior teeth are seen or felt to move, or by the presence of facets show evidence of excessive function in eccentric excursions, the involved areas on the lingual surfaces of the upper anterior teeth are reduced. This does not take anterior teeth out of centric occlusion.

3. Premature contact in posterior teeth in centric position.

If a premature contact between cusp and inclined plane is apparent in both centric and functional relations, the interfering cusp should be reduced. If a premature contact between cusp and inclined plane is apparent in centric relation but is not apparent in functional relation, the interfering fossa should be deepened.

4. Premature contacts on the nonfunctioning side.

If a premature contact is apparent between two cuspal planes on the non-

functioning side during lateral excursions, the involved cusps should be examined in centric position. If one or the other of the involved cusps (upper lingual or lower buccal) is not in contact with the corresponding fossa when the teeth are in centric occlusion, this cusp should be reduced. If either of these cusps is not in contact in the functioning occlusion, the cusp which is not in contact should be reduced.

If both upper lingual and lower buccal involved cusps are in contact in centric occlusion, the mandible should be moved into functioning (working) occlusion on the side involved and the involved cusps should be examined in this position. If both cusps are in contact in centric occlusion and also in functional occlusion, one or the other of these cusps should be reduced but the grinding must not be divided between the two cusps.

5. Interferences on posterior teeth in functional excursion.

If occlusal stresses are not distributed uniformly along the cuspal inclines of all teeth on the functioning side, the steep inclines of the lingual cusps of the lower teeth may be reduced. As many surfaces as possible should be brought into function.

6. Redistribution of protrusive stresses.

The stresses of protrusive excursion of anterior teeth should be distributed over as many anterior teeth as possible. The incisal edges of upper anterior teeth should be reduced and the esthetics should be improved if possible.

The cusps of posterior teeth which are necessary to maintain vertical dimension in centric occlusion must not be reduced and the fossae must not be deepened. Aside from this precaution, grinding of premature contacts on cusps or fossae which prevent anterior incisal contact is permissible.

7. Finishing the equilibration.

All areas on which grinding has been done must be finished with fine cuttle disks. If these surfaces are sensitive, they can be treated by applying sodium fluoride paste by means of a rubber cup on the dental engine.

DISCUSSION OF CASES

An attempt has been made to formulate rules whereby cases of occlusal dysfunction could be divided into those which do and those which do not require the use of mounted study casts. During recent months, cases were studied on the following basis. One of us ((J. W. G.) prepared and mounted study casts on an adjustable articulator and analyzed the occlusal dysfunction from a direct study of the patient's articulation and also from careful examination of the casts. The other author (B. O. A. T.) limited his examination and study to direct observation of the patient's natural dentition. The patient's subjective reactions and sensations during various mandibular excursions were carefully recorded. Articulating papers and waxes were used to determine premature contacts and cuspal interferences. No selective grinding was done at this time, but the cases merely were studied so that records of the findings could be compared. Indicated corrections were then carried out. The primary purpose was to see whether it was possible to ascertain by direct observation facts which could not be determined by studying mounted casts, or vice versa.

The time required to study the cases by direct observation was approximately a third of that necessary to secure and study mounted casts. The results of this study show that there were few instances where a significant amount of additional information was gained by the additional procedures necessary to produce satisfactory study models.

A brief discussion of six typical cases from this study follows.

Case 1 • Premature contact of anterior teeth in centric position, with displacement (Fig. 1).

A 50 year old white man had several posterior teeth missing. False prognathism was evident, caused by anterior displacement of the mandible as a result of premature contacts in the anterior teeth in centric relation.

Treatment • Selective grinding of incisal portions of maxillary and mandibular anterior teeth was done to reverse the inclined planes. Some spot grinding of interfering posterior teeth was necessary to allow development of a limited anterior overbite. The patient applied intermittent pressure in a labial direction on the upper anterior teeth by biting on a narrow wooden tongue blade.

Comment • Mounted study casts of this case were not necessary since all interferences were clearly visible on direct examination, utilizing articulating paper and wax bites. It was imperative that correct relation be established before extensive reconstruction of posterior teeth was done. Existing periodontal pathology can be successfully treated only after abnormal stresses have been eliminated.

Case 2 • Cuspal interference on nonfunctioning (nonworking) side (Fig. 2).

For several years, a 27 year old white woman had been unable to masticate food during lateral excursions of the mandible. This was due to interference of the mandibular third molars on the

Fig. 1 • Case 1. Above left: Teeth in centric relation, incisal contact. Facets on anterior teeth direct mandible anteriorly from this point to full closure. Several posterior teeth missing. Above right: In full closure. Anterior displacement of mandible with anterior cross-bite. Below: In centric occlusion immediately after incisal equilibration and reversal of incisal slopes on anterior teeth. Proper position of mandible now retained on full closure with no anterior displacement

Fig. 2 • Case 2. Mesial and lingual tilting of lower second and third molars caused by loss of first molar and resultant excessive premature contact in bite relation on nonfunctioning side. The rest of the teeth were separated 3 to 5 mm. in lateral bite relation when mandibular third molar was in contact. The condition was present bilaterally and was relieved by extracting mandibular third molars

nonfunctioning side. As a result, the mandible had functioned primarily in the protrusive position.

Treatment • Both lower third molars were extracted, thus allowing the teeth to function in lateral excursions. The patient was educated in the use of the jaw in the lateral functioning positions so that this would become automatic. Proper fixed restorations were constructed for the left side.

Comment • The cuspal interferences in this case were readily observable on direct examination. Study models were not necessary for this purpose but were essential before restorative procedures were begun.

Case 3 • Premature contact of teeth in centric relation and interference in excursions on nonfunctioning and functioning sides (Fig. 3-7).

Periodontal pathology was present in the right molar region of a 57 year old white woman. The lingual aspect of the right mandibular second molar bifurcation was involved. This tooth, serving as a bridge abutment, was of great importance to the patient. The maxillary left second molar had been extracted recently because of advanced trifurcation involvement.

There was a definite premature contact, with the teeth in centric relation, which involved the second bicuspid bridge pontics on the left side. In the nonfunctioning (nonworking) position of the right side, there was definite interference between the mandibular second molar (with the bifurcation involvement) and the maxillary first and second molars. When the right and left cuspids and lateral incisors were in function, they interfered with the functioning of other teeth.

Treatment • Selective grinding was done to relieve (1) premature contacts with teeth in centric position; (2) interferences in nonfunctioning teeth; (3) interferences in functioning teeth. Gingival surgery was done on the lingual aspect of the right mandibular second molar which established a self-cleansing gingival architecture in the bifurcation

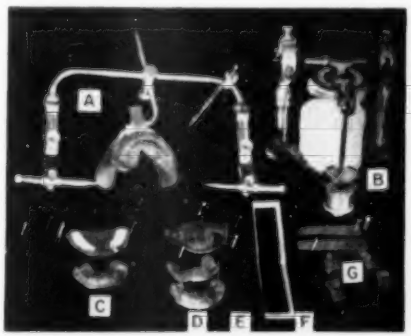

Fig. 3 • Armamentarium used in studying Case 3. A: Down's face-bow. B: Dentatus articulator. C: Centric relation bite and checkbite. D: Wax bites used to check bite relations. E: Cellophane strip for studying premature contacts on articulator. F: Articulating paper. G: Wax bites. D, F and G are used routinely in the study of occlusal dysfunction, whether or not articulator is employed

Fig. 4 • Case 3. Above left: Teeth in centric occlusion. Above right: Showing nonfunctioning teeth on left side. Below left: Showing functioning teeth on left side. Below right: Showing bite relation on nonfunctioning right side

area. Thorough subgingival curettage and instructions in oral hygiene completed the treatment.

Comment • Comparison of the notes made from direct study of the occlusion of the patient and that of the articulated casts showed almost complete agreement on all points of occlusal interference. The time involved in preparing and articulating the casts did not, in this case, produce additional or more accurate information.

Case 4 • Interferences in teeth in centric position, with lateral displacement of the

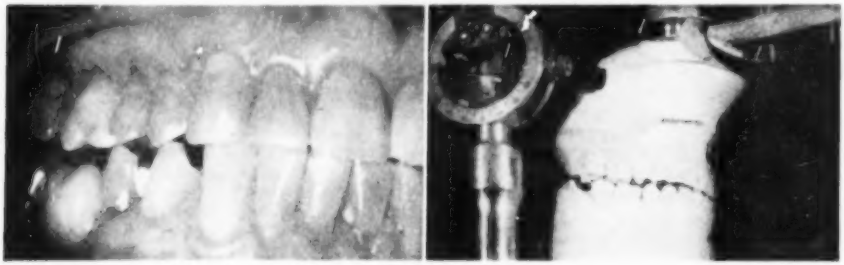

Fig. 5 • Case 3. Left: Bite relation on functioning left side. Right: Articulated models showing premature contact in nonfunctioning molar area, right side

mandible caused by unilateral cross-bite (Fig. 8).

A 25 year old white man had a definite premature contact when his teeth were in centric relation. Also there was a pronounced displacement of the mandible to the right. This was associated with a cross-bite relation of the posterior teeth on the left side. There were no temporomandibular joint symptoms at this time. Four years previously the patient's dentist had placed a fixed bridge in the cross-bite area.

Treatment • At the present time this patient is undergoing treatment which will combine orthodontics and occlusal reconstruction. Selective grinding was not indicated in this case.

Comment • Study models were not necessary to recognize the interference in this case. Earlier orthodontic treatment could have prevented this man's dental problem. The dentist who constructed the technically excellent bridgework did not, apparently, understand the basic rules of occlusion. The restoration merely accentuated the mandibular displacement. Pathologic changes may develop in the periodontium of the involved teeth and in the temporomandibular joint region if this centric interference is not eliminated. Nothing of value could be accomplished in this case by selective grinding without removing excessive amounts of tooth structure. This undoubtedly would have affected the vertical dimension and was, therefore, contraindicated.

Fig. 6 • Case. 3. Models showing premature contact areas on occlusal surfaces. Note definite premature contact on mandibular right second molar

Case 5 • Overclosure of the mandible with deep anterior overbite (Fig. 9).

The patient, a 32 year old white man, was first seen three and a half years ago at which time he was in a depressed mental state. His wife feared he would commit suicide because of severe and constant pain in the temporomandibular joint regions on both sides. He was unable to eat properly and was constantly gritting his teeth. Examination revealed an interocclusal clearance (freeway space) of 9 or 10 mm. and a deep anterior overbite with distal displacement of the mandible.

Treatment • To allow rest and repair of the temporomandibular structures, and also to determine the proper vertical dimension, an acrylic resin occlusal splint was constructed. Immediate relief from the symptoms was noted. The patient was referred to his dentist for construction of permanent restorations which would give the proper vertical dimension and correct the centric occlusion.

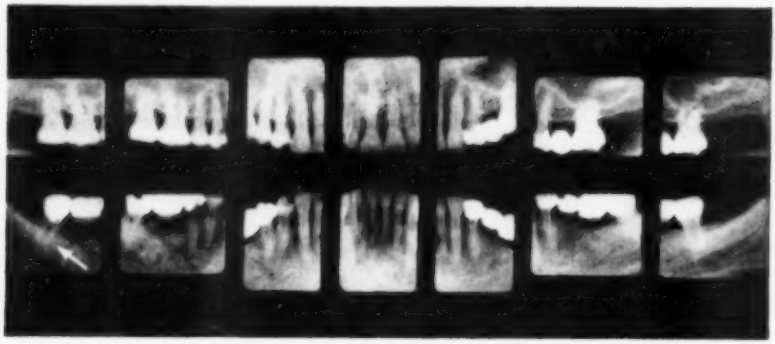

Fig. 7 • Case 3. Showing moderate bone loss in most areas. Traumatogenic forces on mandibular right second molar have resulted in bone resorption to such an extent that the bifurcation is involved (see arrow)

The patient returned after approximately two years and he again had symptoms of joint pain and there was some looseness of molar teeth. Examination showed that the reconstruction had been done with an incorrect centric occlusion. Again an acrylic splint was made and the patient experienced relief from pain. The reconstructive procedures will have to be done again, but the patient will be handled in the clinic under properly qualified instructors.

Comment • This case illustrates the fact that inaccuracies in articulating casts may result in serious dental problems. If study models are to be mounted in an articulator, the correct maxillomandibular relationships must be recorded. Complete study of every case and exacting reconstruction technics are imperative in cases such as this.

Case 6 • Habitual eccentric closure with lateral displacement following initial contact (Fig. 10).

During his high school years, this patient, a 30 year old white man, had noted occasional "snapping" in both temporomandibular joint regions. This was more

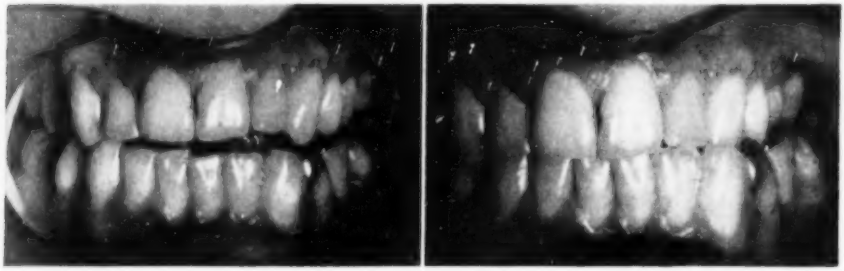

Fig. 8 • Case 4. Left: Teeth in centric relation with initial contact on left side at bridge pontic. Note midline relation. Right: Teeth in centric occlusion showing lateral displacement on full closure. Selective grinding alone would be of little or no value in this case

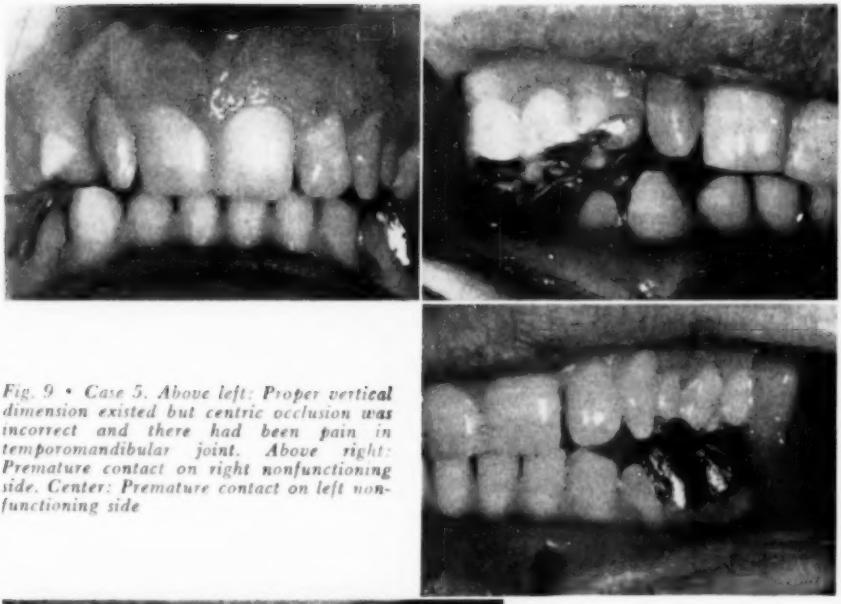

Fig. 9 • Case 5. Above left: Proper vertical dimension existed but centric occlusion was incorrect and there had been pain in temporomandibular joint. Above right: Premature contact on right nonfunctioning side. Center: Premature contact on left nonfunctioning side

Left: Temporary acrylic resin mandibular splints allowed repositioning of the mandible and established correct centric occlusion. Temporomandibular joint pain disappeared during time this appliance was worn

pronounced on the right side. The symptom has been present almost constantly for the past few years.

Examination showed a normal interocclusal clearance of 2 mm. There was initial contact in the right cuspid area, with the mandible displaced 2 mm. to the left as full closure was achieved. Mounted study casts showed this same position. With instruction the patient could close his jaws from rest position directly into centric occlusion with no interference in centric position. There was a premature contact in the right second molar area on the nonfunctioning side and interference in the right and left cuspid areas when those teeth were in function. Re-examination of this patient at two subsequent visits had convinced us that one of two possible explanations

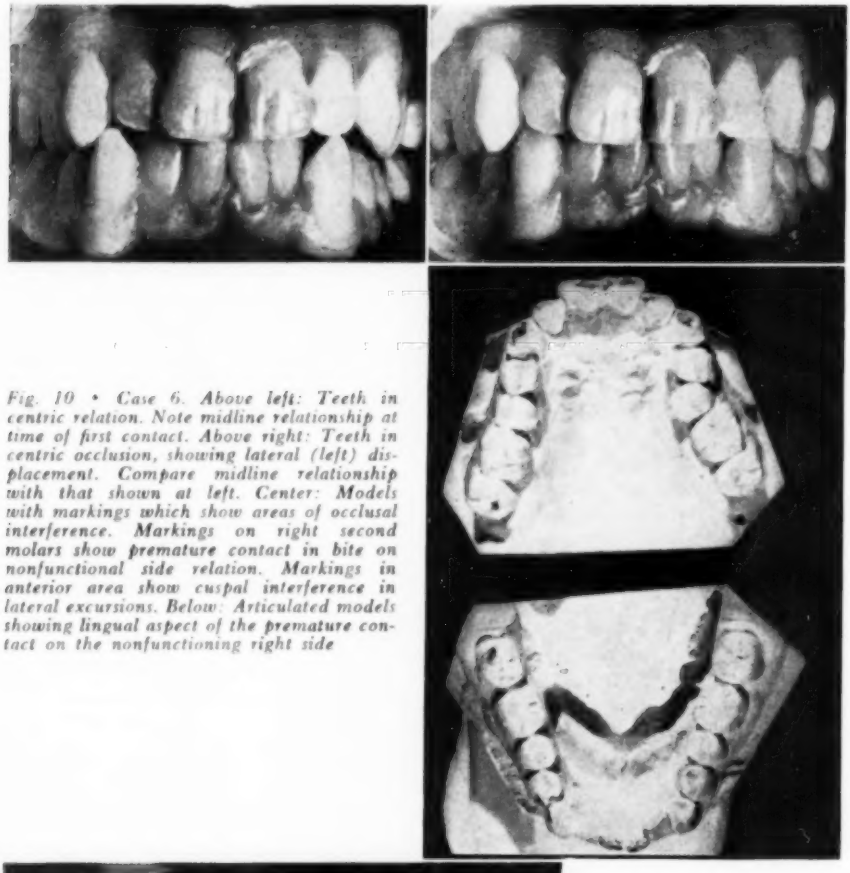

Fig. 10 • Case 6. Above left: Teeth in centric relation. Note midline relationship at time of first contact. Above right: Teeth in centric occlusion, showing lateral (left) displacement. Compare midline relationship with that shown at left. Center: Models with markings which show areas of occlusal interference. Markings on right second molars show premature contact in bite on nonfunctional side relation. Markings in anterior area show cuspal interference in lateral excursions. Below: Articulated models showing lingual aspect of the premature contact on the nonfunctioning right side

existed for abnormal occlusal relationship: (1) muscle imbalance with habitual eccentric closure; (2) lack of harmony between centric relation and centric occlusion, due to abnormal positioning of the teeth.

Treatment • In view of the patient's variable pattern of closure, it was decided to construct a temporary splint which would enable him to overcome his habit of closing in an eccentric position. After he has worn this splint for a few weeks, the occlusal relationships will be checked again and a decision made as to whether selective grinding, occlusal reconstruction or orthodontic therapy is indicated as the method of treatment.

Comment • This case illustrates the great need for careful study and deliberation. The patient's habitual pattern of closure and the hinge axis closure did not coincide, and this led to the clinical symptoms described. Caution must be exercised in the use of selective grinding in the equilibration of occlusion.

CONCLUSIONS

Although external traumatogenic forces are an important factor in periodontal disturbances, it must always be kept in mind that systemic factors may play an important part in the lowered resistance of the periodontium. The accurate diagnosis of an occlusal dysfunction is the essential basis on which correction must rest.

When it is possible to ascertain directly, by means of waxes, articulating papers and other aids, the exact points of premature contact or interference, these can be treated by selective grinding without the necessity of employing mounted casts.

When direct observation does not lead to accurate interpretation of interferences, the use of articulated study models is essential before any grinding is attempted.

Clear Thinking • Yes, clear thinking is rare. To appproach it, we need above all that indispensable quality of the scientific spirit—humility. Like the good scientists, we must be ready to sacrifice some of our personality and habits of thought as we face each new problem. For life's problems are always new, and defy all ready-made solutions.

That's what makes life so interesting. *Rudolf Flesch, The Art of Clear Thinking.*

The role of periodontal foci of infection in systemic disease: an evaluation of the literature

David F. Mitchell, D.D.S., Ph.D., and Edith Zak Helman,† M.S., Minneapolis*

Ever since the early 1900's when Hunter[1] and Billings[2] introduced the concept of focal infection, that concept has been one of the most controversial issues in medical and dental history. Introduced in a period when bacteriological methods were crude, the theory was based largely on clinical evidence. Later, experimental evidence was contributed by Rosenow,[3-5] Price[6] and Haden.[7] For about two decades the theory was so widely and indiscriminately accepted that a focus was regarded by many as "anything readily accessible to surgery."[8] The inability of several workers to repeat the experimental work of Rosenow and others and a more careful consideration of the clinical data caused skepticism, with the result that the theory of focal infection, especially Rosenow's theory of elective localization, fell into disrepute.[9-13] Now, however, it may prove profitable to re-evaluate the evidence concerning the theory of focal infection.

Recently an evaluation[16] was made of the effect of dental foci of infection on health, especially with reference to the periapical area. Since periodontal foci may be as significant as periapical foci, it appears equally important to evaluate also the effect of periodontal foci of infection on health. This evaluation is based on a survey of the dental literature of the twentieth century and especially of the last decade.

The subject is considered from a general viewpoint; certain basic terms are defined, and theories on the etiology of periodontal diseases are summarized briefly. Various hypotheses on the relationship between periodontal disease and focal infection are presented under the

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†Assistant scientist, School of Dentistry, University of Minnesota.

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6. Price, Weston A.: Dental infections and degenerative diseases, vol. 2, Researches on clinical expressions of dental infections. Cleveland, Penton Publishing Co., 1923.

7. Haden, Russell L.: Dental infection and systemic disease, ed. 2. Philadelphia, Lea & Febiger, 1936.

8. Coolidge, E. D.: Endodontia; the clinical pathology and treatment of the dental pulp and pulpless tooth. Philadelphia, Lea & Febiger, 1950, p. 281.

9. Holman, W. L.: Focal infection and "elective localization"; critical review. Arch. Path. & Lab. Med. 5:68 (Jan.) 1928.

10. Valentine, E., and Van Metter, M.: Localization of streptococci in tissues of rabbits. J. Infect. Dis. 47:56 (July) 1930.

subdivisions: mechanism, bacteremia, prevention and treatment, and periodontal foci versus periapical foci in systemic diseases. Current concepts of the role of periodontal foci in specific types of systemic diseases are considered.

GENERAL CONSIDERATIONS

Basic Definitions • Certain basic definitions are essential for a clear understanding of the terminology used in this paper. The periodontium is composed of those tissues which surround and support the teeth; namely, the gingivae, the periodontal membrane, the alveolar bone and the cementum.[17] The term periodontal disease is commonly given to all types of diseases which affect the gingivae and dental supporting tissues.[18] Rosebury uses the term to mean "any inflammatory process of the gingival or periodontal tissues and its precursory states, except those of a specific infective character."[19]

Gingivitis is defined as an inflammation of the gingivae. The condition may be further described by such adjectives as acute, chronic, purulent, ulcerative, hyperplastic and scorbutic.[20] Schour and Massler[21] coined the term gingivosis to describe a noninflammatory degeneration of gingival tissues.

The committee on nomenclature of the American Academy of Periodontology in 1947[20] defined periodontitis as an inflammation of the periodontium. Periodontitis simplex is a sequela of chronic gingivitis while periodontitis complex is associated with systemic disease or is secondary to periodontosis. In contrast to periodontitis, periodontosis is a noninflammatory destruction of the periodontium, characterized by degeneration of regular, that is, functionally arranged, connective tissue elements of the periodontal membrane; it leads to bone resorption, epithelial proliferation, migration of teeth, pocket formation and, ultimately, exfoliation of teeth.[20] A pathologically deepened sulcus extending into the former periodontal membrane apically to the original level of the resorbed alveolar crest is a periodontal pocket.[20] The committee on nomenclature in 1947 recommended that the term periodontoclasia be discarded. It was used previously to indicate nonspecifically and collectively all destructive and degenerative diseases of the periodontium.[20]

Any localized infection is potentially a focus of infection. The development of secondary lesions traceable to this primary focus constitutes focal infection.[16]

Etiology of Periodontal Disease • The etiology of periodontal disease has been discussed extensively by various writers. Goldman[22] divides the causes of periodontal disease into two groups: (1) local factors such as oral sepsis and occlusal trauma and (2) systemic factors such as nutritional deficiencies, endocrine imbalances and blood diseases. Infection as an etiological agent in periodontal dis-

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18. Smith, Rowe. Etiology and classification of paradontosis (pyorrhea alveolaris). J.A.D.A. 29:2152 (Dec.) 1942.

19. Rosebury, Theodor. Nature and significance of infection in periodontal disease. Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.) 33:658 (Sept.) 1947.

20. Nomenclature in periodontia (report of the committee on nomenclature of the American Academy of Periodontology—1947). J. Periodont. 18:112 (July) 1947.

21. Schour, Isaac, and Massler, Maury. Gingival disease in postwar Italy (1945). II. Gingivosis in hospitalized children in Naples. Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.) 33:756 (Oct.) 1947.

22. Goldman, H. M. Periodontia; a study of the histology, physiology and pathology of the periodontium and the treatment of its diseases, ed. 2. St. Louis, C. V. Mosby Co., 1949, p. 186.

case is regarded as secondary to the noninfective factor;[19] however, "the bacterial contamination may be a potent creator of local and distant disturbances."[23]

The following microorganisms have been shown to be present in periodontal lesions: *Streptococcus viridans, Streptococcus hemolyticus, Staphylococcus aureus, Staphylococcus albus,* pneumococci, diplococci, bacilli, spirilla, spirochetes, streptothrices, a variety of yeasts and amebae.[24, 25] Appleton,[26] in discussing microorganisms of advanced periodontal disease, lists a number of references showing that spirochetes, either with or without fusiform bacilli, have been recognized as prominent members of the flora of periodontal lesions. He states that the literature which concerns the organisms of periodontal disease can be divided into two parts, one laying the major stress on ordinary pyogenic cocci and the other emphasizing the importance of spirochetal or fusospirochetal forms.

In addition, he asserts:[27]

> At the present time, I believe that most of the lesions of the soft tissues of the mouth and of the periodontal structures are not primarily caused by bacteria or other organisms. The bacteria are there, often in greatly increased numbers, and they may aggravate and accelerate the lesion.

Rosebury,[19] citing the work of various persons, agrees, saying that

> precursory tissue damage, usually non-infective in origin, is essential for the establishment of periodontal disease. The character of the periodontal infection including its severity and chronicity, depends on the nature of the precursory stage. Infection as an etiological factor is thus regarded secondary to a non-infective factor.

The bacteria listed by Appleton are, of course, found also in the normal mouth. *Str. viridans* is the predominating organism in the normal oral flora, while *Str. hemolyticus* is found in small numbers. When *Str. hemolyticus*, Lancefield Group A, is found in large numbers, this increase is indicative of an infection or a carrier. Oral spirochetes are opportunists which can increase whenever anaerobic conditions are present. A dirty mouth yields as many spirochetes as a mouth with chronic Vincent's infection. The difficulty of evaluating the presence of bacteria in a periodontal pocket is the same as that of evaluating cultures from extracted teeth; in either case contamination by the normal oral flora cannot be disregarded.

PERIODONTAL DISEASE AND FOCAL INFECTION

Though many articles have been written on various phases of periodontal disease and focal infection, as yet few indisputable conclusions have been reached.

Mechanism • Curtis[28] and Appleton,[29] who believe that more than one mechanism may be involved in the production of focal infection, name the following as the most important: (1) an actual metastasis of organisms from a focus by way of blood or lymph channels, (2) a diffusion into the lymph or blood and hence into remote parts of the body of products of bacterial metabolism, (3) a sensitization, in an allergic sense, of various tissues by products of bacterial autolysis at the focus, which have diffused into the blood or lymph.

Another theory concerning the mecha-

23. Miller, S. C. Textbook of periodontia, ed. 3. Philadelphia, Blakiston Co., 1950, p. 685.

24. Sand, R. A. Periodontal sepsis in relation to systemic disease. J.A.D.A. 28:710 (May) 1941.

25. Merritt, A. H. Periodontal diseases: diagnosis and treatment. New York, Macmillan Co., 1939, p. 157.

26. Appleton, J. L. T. Bacterial infection with special reference to dental practice, ed. 3. Philadelphia, Lea & Febiger, 1950, p. 524.

27. Appleton, J. L. T. The bacteriologist looks into the patient's mouth. J.A.D.A. 27:171 (Feb.) 1940.

28. Ward, M. L. American textbook of operative dentistry, ed. 7. Philadelphia, Lea & Febiger, 1940, p. 751.

29. Appleton, J. L. T., Jr. Bacterial infection with special reference to dental practice, ed. 3. Philadelphia, Lea & Febiger, 1944, p. 401.

nism of focal infection may be inferred from these statements of Menkin:[30]

> It is well known that bacteria often float in the blood, from where they are eliminated by various bactericidal substances. When a traumatic or other kind of injury occurs, such bacteria may localize in injured areas where they accentuate the inflammatory process. This is often referred to by pathologists and clinicians as a *locus minoris resistentiae*. It has been shown that bacteria introduced into the circulation accumulate into an inflamed area. It may therefore be that a so-called *locus minoris resistentiae* can be explained in terms of increased capillary permeability in an area of injury followed by localization of various bacteria from the circulation.

In line with this reasoning, Miller[31] states:

> The routes by which infection from periodontal pockets may spread are:
> (1) through the blood and lymph,
> (2) by direct extensions within the tissue,
> (3) by direct contiguity of the gastrointestinal and pulmonary tracts, through the swallowing and aspiration of infective material.

He adds: "the rich supply of blood vessels to the gingivae from those supplying the periodontal membrane, alveolar bone and connective tissue stroma allows for a ready exit of organisms from the periodontal pocket." He asserts also that there is an abundant lymph supply to the gingivae and soft tissues and that infection can readily reach the neighboring lymph nodes. The importance of the lymphatic system in this regard was stressed also by Weinmann.[32]

Fish and MacLean[33] postulated that the pumping action resulting from extraction may pump bacteria from the gingival crevices or periodontal pockets into the capillaries of the pulp of the tooth. They attempted to prove their point by limited experiments on teeth extracted from the same patient. Two were removed in the regular manner, and two were extracted after cauterization of the pockets. Organisms were found in the pulps of the former teeth but not in those of the latter. Kanner[34] attempted to copy *in vitro* the mechanism of pumping or sucking bacteria into the pulps of extracted teeth by way of the apical foramen. He concluded that bacteria may enter the pulps of teeth by capillary attraction.

Burket and Burn[35] painted a suspension of *Serratia marcescens* around the necks of the teeth to be extracted in 90 patients. In 18, this organism was recovered from the blood stream; and in 18 others, other organisms were detected. These investigators concluded that although the gingival crevice can be a source of entry for bacteria there are probably other sites of equal or greater importance. When blood vessels are opened during tooth extraction, there is ready opportunity for oral organisms to enter the blood stream. *Str. viridans*, the predominant organism of the mouth, presumably has an opportunity to get into the blood stream in the greatest number; however, other organisms may follow the same path.

Cecil and Angevine[36] found, as a result of experiments in which bacteria were injected into various sites in the body and then recovered in the blood stream, that gingivae are particularly favorable sites for the absorption of bacteria. Several workers, using human gingival tissue which had been removed for biopsy, supplied histological evidence that in gingi-

30. Menkin, Valy. Newer concepts of inflammation. Springfield, Ill., Charles C Thomas, 1950, p. 36.

31. Miller, S. C. Textbook of periodontia, ed. 3. Philadelphia, Blakiston Co., 1950, p. 688.

32. Weinmann, J. P. Progress of gingival inflammation into the supporting structures of the teeth. J. Periodont. 12:71 (July) 1941.

33. Fish, E. Wilfred, and MacLean, I. The distribution of oral streptococci in the tissues. Brit. D. J. 61:336 (Sept.) 1936.

34. Kanner, Oscar. How may bacteria enter the pulps of intact teeth? J. D. Res. 17:47 (Feb.) 1938.

35. Burket, Lester W., and Burn, Caspar G. Bacteremias following dental extraction. Demonstration of source of bacteria by means of a non-pathogen (Serratia marcescens). J. D. Res. 16:521 (Dec.) 1937.

36. Cecil, R. L., and Angevine, D. M. Clinical and experimental observations on focal infection, with analysis of 200 cases of rheumatoid arthritis. Ann. Int. Med. 12:577 (Nov.) 1938.

vitis and periodontitis bacteria not only are present on the surface but have penetrated into the gum tissue.[37-41] There is also clinical and histological evidence that periodontal infection can spread directly and cause a frank osteomyelitis.[42] Such an osteomyelitis, it should be pointed out, involves local extension and not focal infection.

Graham[43] obtained filtrates from periodontal pockets of patients with advanced periodontal disease. After being sterilized by passage through Seitz filters, which do not remove viruses, the filtrates were injected into experimental animals. They proved fatal to 15 of the 25; it was found that the liver and kidneys were affected.

Ray and Orban,[44] basing their opinion on histological studies of the gingiva, state:

> The frequency and multiple occurrence of deep necrotic foci in the gingiva are unquestionable evidence of the penetration of toxins into the tissue and thus also for the possibility of their absorption into the blood stream.

From a bacteriological viewpoint, it is clear that little evidence has been submitted to show that the organisms in these foci produce toxins. The viridans and anhemolytic streptococci do not produce toxins, although some strains of hemolytic streptococci, as well as some strains of *Staph. aureus*, can do so under certain conditions.

Bacteremia Resulting from Dental Manipulations: Effect of Presence or Absence of Periodontal Disease • Richards[45] found that massage of infected gums caused bacteremia in three out of 17 cases. Hopkins[46] also reports three cases of bacteremia in which *Str. viridans* and *Staph. aureus* predominated and which resulted from manipulation of infected gums. Round, Kirkpatrick and Hails[47] reported two positive blood cultures from five patients with periodontal disease who had chewed on mint lumps. None of five control patients with healthy mouths who had undergone the same experimental procedure exhibited a transient bacteremia.

Murray and Moosnick[48] asked 360 patients with varying degrees of dental caries and periodontal disease to chew paraffin cubes for half an hour. Fifty-five per cent of these patients showed positive blood cultures. Diplococci and *Staph. albus* were recovered. Many bacteriologists consider *Staph. albus* a contaminant unless proved otherwise. The diplococci also should probably be regarded as contaminants. This unusually high number of positive cultures and the isolation of the organisms indicated do not permit ruling out the possibility of contamination as a result of the technic used.

Fish[49] reports that bacteremia occurred in one out of four gingivectomies performed for the treatment of periodontal disease. Burket and Burn[35] in 1937 showed that massage of gums as well as extraction leads to bacteremia. They proved their point by using *S. marcescens*,

37. Beckwith, T. D.; Simonton, F. V., and Williams, Adrienne. A histologic study of the gums in pyorrhea. J.A.D.A. 12:129 (Feb.) 1925.

38. Beckwith, T. D. The presence of bacterial micro-organisms within human gingival tissue in gingivitis. Proc. Soc. Exper. Biol. & Med. 23:140 (Oct. 24) 1925.

39. Beckwith, T. D.; Simonton, G. W., and Rose, E. J. The presence of bacterial micro-organisms in human gingival tissue in gingivitis. D. Cosmos 69:164 (Feb.) 1927.

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44. Ray, H. G., and Orban, Balint. Deep necrotic foci in the gingiva. J. Periodont. 19:91 (July) 1948.

45. Richards, J. H. Bacteremia following irritation of foci of infection. J.A.M.A. 99:1496 (Oct. 29) 1932.

46. Hopkins, J. A. Streptococcus viridans: bacteremia following extraction of the teeth. J.A.D.A. 26: 2002 (Dec.) 1939.

47. Round, Harold; Kirkpatrick, H. J. R., and Hails, C. G. Further investigations on bacteriological infections of the mouth. Proc. Roy. Soc. Med., Sec. Odont. 29:1552 (Oct.) 1936.

48. Murray, M., and Moosnick, F. Incidence of bacteremia in patients with dental disease. J. Lab. & Clin. Med. 26:801 (Feb.) 1941.

49. Fish, E. Wilfred. Local and remote sequelae of infection in the paradontal sulcus. Proc. Roy. Soc. Med., Sec. Odont. 30:1149 (July) 1937.

a nonpathogenic organism normally not found in man. It was recovered in the blood up to 10 minutes after it was instilled in the mouth and the gums were massaged.

Elliott,[50] in studying the effects of rocking of teeth in sockets prior to extraction, found the incidence of positive cultures to be greater in the presence of gingival disease. Twenty-five per cent of the cases with no detectable gum disease showed bacteremia, while 86 per cent of the cases with marked periodontal disease showed bacteremia. *Str. viridans* was isolated in nearly all cases.

There is ample evidence to show that bacteremia follows extraction of teeth. Okell and Elliott[51] took blood cultures before and after the extraction of teeth of patients with no obvious periodontal disease and found that 34 per cent demonstrated bacteremia, usually *Str. viridans*. For anesthesia, they used nitrous oxide. The incidence of bacteremia in extraction cases when moderate or marked gingival disease was present was significantly greater than when it was absent; in the former cases it reached 75 per cent. These investigators found also that in 110 cases of periodontal disease, 12 (10.9 per cent) were found to have a streptococcal bacteremia at the time of the examination, irrespective of operative procedure. Blood cultures were made from two control groups composed of 68 patients with no obvious dental diseases; all were negative.

Further evidence that bacteremia after extractions is more prevalent in the presence of periodontal disease has been provided by Fish and MacLean,[53] Feldman and Trace,[52] Palmer and Kempf,[53] Geiger[54] and Rhoads, Schram and Adair.[55] Peterson[56] found that extremely conservative treatment of periodontal disease resulted in bacteremia in 5 of 78 cases, an incidence of 6.4 per cent; but this incidence is not as high as other investigators have found in their control groups.

On the other hand, Glaser and others[57] found that no significant difference in respect to bacteremia resulting from oral manipulations existed between normal and abnormal gingival conditions. Lazansky, Robinson and Rodofsky[58] in a comprehensive report state that the presence of periodontal disease, the variation in tooth mobility or apical infection does not appear to predispose to bacteremia. They found, however, that transient bacteremia developed in 10 per cent of 221 patients who underwent operations and in five of 72 patients who underwent periodontal scaling.

Most of the preceding workers found that unless a complicated condition accompanied the extraction or the manipulation, the bacteremia was of short duration, lasting only 10 to 30 minutes in most patients. Northrop[59] states that bacteremia in the normal individual probably is of little significance since the blood stream quickly destroys the newly introduced organisms. In this connection, Easlick[16] presents a review of defenses in blood and other tissues that combat bacteria.

In the individual with valvular heart disease, however, these bacteria may

50. Elliott, S. D. Bacteriaemia and oral sepsis. Proc. Roy. Soc. Med. 32:747 (May) 1939.

51. Okell, C. C., and Elliott, S. D. Bacteriaemia and oral sepsis with special reference to the etiology of subacute endocarditis. Lancet 2:869 (Oct. 19) 1935.

52. Feldman, L., and Trace, I. M. Subacute bacterial endocarditis following removal of teeth or tonsils. Ann. Int. Med. 11:2124 (June) 1938.

53. Palmer, H. D., and Kempf, M. Streptococcus viridans bacteremia following extraction of teeth; case of multiple mycotic aneurysms in pulmonary arteries; report of cases and necropsies. J.A.M.A. 113:1788 (Nov. 11) 1939.

54. Geiger, A. J. Relation of fatal subacute bacterial endocarditis to tooth extraction. J.A.D.A. 29:1022 (June) 1942.

55. Rhoads, P. S.; Schram, W. F., and Adair, Dorris. Bacteremia following tooth extraction; prevention with penicillin and NU 445. J.A.D.A. 41:55 (July) 1950.

56. Peterson, W. A. Traumatogenic bacteremias of dental origin. Thesis, University of Minnesota, 1950.

57. Glaser, R. J., and others. Effect of penicillin on bacteremia following dental extraction. Am. J. Med. 4:55 (Jan.) 1948.

58. Lazansky, J. P.; Robinson, Leonard, and Rodofsky, Lillian. Factors influencing the incidence of bacteremias following surgical procedures in the oral cavity. J. D. Res. 28:533 (Dec.) 1949.

59. Northrop, P. M. Penicillin therapy in oral surgery. J. Oral Surg. 7:39 (Jan.) 1949.

localize on the heart valves and produce subacute bacterial endocarditis. Northrop points out that subacute bacterial endocarditis is usually produced by *Str. viridans,* the organism most frequently found in the blood stream after dental extraction. Reichel,[60] although he shows that bacteria are removed rapidly from the blood stream, the majority being removed within 10 minutes, states:

> If bacteria enter after operative intervention within an infected region, a short period of time will ensue during which a positive blood culture may be expected to appear, but the culture will not persist unless there is a focus of infection in the vascular system itself such as endocarditis, or unless the blood stream is invaded by an organism which is not affected by the defensive action of the reticulo-endothelial system.

Prevention and Treatment of Bacteremia Resulting from Dental Manipulations • Round, Kirkpatrick and Hails[47] favor the use of a general anesthetic for dental surgery since their experiments indicate that a local anesthetic forces bacteria deep into the tissues. Vanderhoof and Davis,[61] Craig[62] and Abrahamson[63] also favor a general anesthetic since they believe its use affords more time in operating and therefore results in less trauma. This conclusion is open to question.

Burket and Burn,[38] Hopkins,[46] Northrop and Crowley[64] and Bender and Pressman,[65] on the other hand, favor a local anesthetic. They found that they could reduce the incidence of bacteremia by means of conduction or infiltration anesthesia. The reason suggested for this effect is that the vasoconstrictive action of the epinephrine reduces absorption of bacteria.

Abrahamson,[63] Hopkins[46] and Bender and Pressman[65] support the theory that in potential endocarditis cases only one or two teeth should be extracted at a sitting. Lazansky, Robinson and Rodofsky[58] found that a significantly greater incidence of bacteremia occurred after extraction of two or more teeth than after the extraction of a single tooth. They found also that the amount of trauma exerted a definite influence on the incidence of bacteremia. This latter view is held also by Round, Kirkpatrick and Hails,[47] Craig,[62] Barnfield[66] and Bender and Pressman.[65]

Feldman and Trace,[52] Faillo[67] and Lazansky, Robinson and Rodofsky[58] suggest building up the patient, especially in cases of subacute bacterial endocarditis, to the best possible physical condition in order to reduce the effects of any bacteremia which might be induced.

Cauterization of the gingival sulcus to destroy bacteria and to prevent their being forced into the blood stream by trauma and by the rocking effects of extraction has been advocated by Fish and MacLean,[38] Faillo[67] and Elliott.[80] The latter investigator also emphasized reduction of oral sepsis and good oral hygiene prior to surgery in cardiac cases.

Prophylactic doses of antibiotics prior to dental extractions or periodontal treatments have been suggested by many workers since 1940. Reduction of bacteremia and prevention of the development of subacute bacterial endocarditis through the use of sulfonamides after manipulations of infected teeth have

60. Reichel, H. A. Removal of bacteria from the blood stream; experiments tending to determine rate of removal of injected bacteria. Proc. Staff Meet. Mayo Clin. 14:138 (March 1) 1939.

61. Vanderhoof, D., and Davis, D. Subacute bacterial endocarditis following extraction of teeth with report of 2 cases. Virginia M. Monthly 60:151 (June) 1933.

62. Craig, Philip. Endocarditis and its dental interrelations. Ann. Den. 5:100 (June) 1938.

63. Abrahamson, L. Subacute bacterial endocarditis following removal of septic foci. Brit. M. J. 2:8 (July 4) 1931.

64. Northrop, P. M., and Crowley, Mary C. Prophylactic use of sulfathiazole in transient bacteremia following the extraction of teeth. A preliminary report. J. Oral Surg. 1:19 (Jan.) 1943.

65. Bender, I. B., and Pressman, R. S. Factors in dental bacteremia. J.A.D.A. 32:836 (July) 1945.

66. Barnfield, W. F. Subacute bacterial endocarditis and dental procedures. Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.) 31:55 (Feb.) 1945.

67. Faillo, P. S. Blood findings on twenty patients before and after extraction of teeth. J.A.D.A. 21:19 (Feb.) 1942.

been reported by Hageman,[68] Paquin,[69] Clagett and Smith,[70] Geiger,[54] Willius and Brown,[71] Barnfield,[66] Budnitz, Nizel and Berg,[72] Northrop and Crowley[64] and Pressman and Bender.[73] One group[72] recorded 27 cases of valvular and congenital heart disease in which the prophylactic regime was adopted with no untoward reactions. No postoperative positive blood cultures nor cases of subacute bacterial endocarditis were found.

Penicillin has been used with varying degrees of success by Rhoads, Schram and Adair[55] and by Merril and others.[74] Northrop,[75] using penicillin prophylactically, detected bacteremia in only one among 281 patients. The blood samples were taken within 10 minutes after the surgical procedures. Pulaski and Amspacher[76] report a study of the success obtained with streptomycin. The prophylactic use of aureomycin has been advocated by Cipes,[77] Jacobs and Jacobs,[78] Krasse, Lundquist and Winblad,[79] Long,[80] Roth and others,[81] Stewart and Roth[82] and Tempestini.[83]

Periodontal Foci Versus Periapical Foci in Systemic Disease • On the basis of their own clinical experience and an evaluation of the available experimental data, many authors have stated their opinions as to the relative importance of periodontal and periapical foci of infection in relation to systemic disease.

As early as 1926 Simpson[84] declared that "the fanatical quest of periapical infection has, by distraction, produced an utter disregard for the injurious effect of marginal infection." He calls attention to the overused pretension that escaping pus nullifies the action of the organisms present. He states further:

> the presence of infected fibrous tissue, subjected to impacts and heavy pressure, and partially decalcified bone contiguous to lymphatic and a profuse capillary circulation is a serious danger despite intermittent and inadequate drainage.

Hatton[85] and Miller[86] consider periodontal pockets as important as periapical infections in their role as sources of blood-borne bacteria. They urge treatment of periodontal pockets to remove possible foci of infection. Sand[87] stresses the fact that periodontal sepsis should be given as much weight as periapical sepsis in the consideration of potential foci, declaring:

> Even if we grant that every pulpless tooth is not infected, we must admit that every tooth

68. Hageman, P. O. The use of sulfanilamide. J.A.D.A. 27:909 (June) 1940.

69. Paquin, O., Jr. Bacteremia following the removal of diseased teeth. J.A.D.A. 28:879 (June) 1941.

70. Clagett, A. H., Jr., and Smith, E. H., Jr. Subacute bacterial endocarditis and dental extraction. J.A.D.A. 28:1841 (Nov.) 1941.

71. Willius, F. A., and Brown, A. E. Prophylactic use of sulphonamide compounds as it concerns subacute bacterial endocarditis (Streptococcus viridans) and dental extractions. J. Canad. D. A. 10:107 (March) 1944.

72. Budnitz, Edward; Nizel, Abraham, and Berg, Leo. Prophylactic use of sulfapyridine in patients susceptible to subacute bacterial endocarditis following dental surgical procedures. J.A.D.A. 29:346 (March) 1942.

73. Pressman, R. S., and Bender, I. B. Effect of sulfonamide compounds on transient bacteremia following extraction of teeth. Arch. Int. Med. 74:346 (Nov.) 1944.

74. Merril, Arthur, and others. Penicillin in the prevention of post-extraction bacteremia. J.A.D.A. 42:395 (April) 1951.

75. Northrop, P. M. Penicillin therapy in oral surgery. J. Oral Surg. 7:39 (Jan.) 1949.

76. Pulaski, E. J., and Amspacher, W. H. Streptomycin therapy for bacteremia. Am. J. Surg. 73:347 (March) 1947.

77. Cipes, L. R. Aureomycin. Report of clinical use in 90 cases of bacterial infection in the oral cavity. New York D. J. 16:450 (Oct.) 1950.

78. Jacobs, H. G., and Jacobs, M. H. Aureomycin: its use in infections of the oral cavity. Oral Surg., Oral Med. & Oral Path. 2:1015 (Aug.) 1949.

79. Krasse, Bo; Lundquist, Tandl., and Winblad, Sten. Aureomycinets lokala effekt på den aerobe munfloran hos friska. Odont. Revy. 1:28 (Nov.) 1950.

80. Long, P. H. Clinical use of antibiotics: treatment of dental infections. U. S. Armed Forces M. J. 1:1109 (Oct.) 1950.

81. Roth, O., and others. Aureomycin in prevention of bacteremia following tooth extraction. Arch. Int. Med. 86:498 (Oct.) 1950.

82. Stewart, G. M., and Roth, L. H. Use of aureomycin in oral infection. A preliminary report. J.A.D.A. 40:563 (May) 1950.

83. Tempestini, O. Primi risultati sull' impiego della aureomicina nelle infezioni orali e periorali. Riv. ital. di Stomatol. 4:1285 (Dec.) 1949.

84. Simpson, Clarence O. Radiographic indications and contra-indications for surgical interference. J.A.D.A. 13:207 (Feb.) 1926.

85. Hatton, Edward H. Focal infection from the point of view of the dentist. J.A.D.A. 13:778 (June) 1926.

86. Miller, Israel S. Dental infection and systemic disease. D. Digest 36:145 (March) 1930.

87. Sand, R. A. Periodontal sepsis in relationship to systemic disease. J. Periodont. 11:18 (Jan.) 1940.

affected periodontally is theoretically infected and must be treated or removed to eradicate the existing infection.

Among the proofs Sand advances to show that periodontal lesions are, if anything, more serious than periapical lesions is the existence of the large periodontal area through which, it would seem, there can occur penetration and absorption of bacteria and toxins.

Miller and Burman[88] affirm:

> when it is realized that a much greater and more vascular area is involved in periodontal breakdown than in periapical infection, and that gingival pockets provide an excellent place for bacterial growth, it is apparent that there is a definite possibility of periodontal foci of infection.

Ensign[89] asserts:

> the importance of periodontoclasia deserves more than a passing mention. This is frequently overlooked as a focus, partly because it is such a common condition and partly because many physicians believe that the lesions of pyorrhea have free drainage to the outside and therefore not much general absorption is apt to occur. However, when the lesion is advanced enough to cause pockets and visible bone destruction,—such a pocket can be as much a focus as an infected tonsil crypt.

Masuda[90] contends:

> focal infection from apices of teeth has been considered an important phase in systemic disturbances, and as a matter of fact, it has been exaggerated at times. However, slight and insufficient attention has been given to the absorption of bacteria and their toxins from periodontal pockets.

He states further, without distinguishing the producers of true toxins, that periodontal disease is a

> diffuse disease capable of infesting the circulation with various organisms, particularly the streptococcus group, or their toxic products by the way of the blood and lymph channels as well as through the gastrointestinal tract.

Burket,[91] without the submission of evidence, contends that periodontal lesions not only are more prevalent than periapical granulomas but contain a heavier bacterial flora, which is composed of more potentially pathogenic organisms. He states:

> The unprotected gums and dental periosteum are more vascular and have an extensive lymphatic system which favors the dissemination of bacteria or their products to other areas of the body. Furthermore the periodontal tissues are not protected to the same extent as the periapical tissue from external trauma and irritation.

He concludes that "the periodontal tissues can be considered as the most important oral focus of infection."

Ray and Orban[44] found that 69 per cent of the gingival biopsies from 100 patients with some degree of gingivitis showed necrotic foci deep in the gingival tissue. They conclude that "the frequency and multiple occurrence of such necrotic foci in a chronic disease stamps even a simple gingivitis as a disease having the potentiality of leading to systemic disturbances."

Appleton,[92] speaking of multiple foci of infection, says: "even in the mouth, it has been frequently overlooked that periodontal infection may be at least as significant as periapical infection." Boyle[93] states: "Recent evidence that bacteremia occurs after the extraction of teeth and can be prevented by cauterizing the gingival sulcus has emphasized the importance of the periodontal lesions as foci of infection." Comroe, Collins and Crane[94] also express the opinion that

88. Miller, Samuel Charles, and Burman, Louis R. Periodontal disease as a possible focus of infection (Abst.) J. Am. Col. Den. 10:71 (March) 1943.

89. Ensign, D. C. Oral focal infection: its status today, with particular reference to arthritis. J. Oral Surg. 3:89 (April) 1945.

90. Masuda, B. J. Medico-dental aspects of periodontal disease. D. Items Interest 68:215 (March) 1946.

91. Burket, Lester W. Oral medicine: diagnosis, treatment. Philadelphia, J. B. Lippincott Co., 1946, p. 532.

92. Appleton, J. L. T. Infection of the teeth and oral cavity in relation to constitutional disease. Ann. Den. 8:117 (Dec.) 1949.

93. Boyle, Paul E., editor. Kronfeld's Histopathology of the teeth and their surrounding structures, ed. 3. Philadelphia, Lea & Febiger, 1949, p. 220.

94. Comroe, B. I.; Collins, L. H., and Crane, M. P. Internal medicine in dental practice, ed. 3. Philadelphia, Lea & Febiger, 1949, p. 503.

periodontal disease may be of great significance in systemic disease.

Miller[23] summarizes the argument thus:

> Until recently, the only recognized oral foci were periapical areas. However, evidence has been accumulating in the past few years to show that *periodontal pockets* are much more dangerous factors in producing focal infection disease because:
>
> 1. A much greater zone is involved than that in a periapical abscess, considering the total surface area of the walls of all the pockets. It can safely be stated that at least 20 times the absorption surface is involved in an average case of periodontal disease than in a well developed chronic periapical abscess.
> 2. Absorption from the gingival sulcus is more rapid since the blood and lymph supply to the gingivae is much greater than to the periapical area in bone, especially when the latter is surrounded by even a slight degree of condensation or encapsulation.
> 3. Resistance to bacterial growth is lower in the gingival sulcus than any where else in the oral cavity because of food accumulation and stagnation.

As previously stated, it should be noted that the material presented in this section is based more on the subjective interpretation of the authors quoted than on valid, controlled scientific research.

ROLE OF PERIODONTAL FOCI IN TYPES OF SYSTEMIC DISEASES

Considerable clinical and some experimental evidence has been published supporting the theory that periodontal foci of infection are etiological or aggravating agents in many systemic diseases. In evaluating the literature on this subject, it is well to keep in mind some of the pros and cons of the theory of focal infection in general.

Coolidge[8] lists four points that are cited in favor of the theory of focal infection, the first of which is stated thus:

> 1. In some cases the same strains of bacteria have been isolated from both the primary and secondary focus. This may be interpreted to prove that bacteria from the primary focus lodged in a distant area and produced a secondary area of infection.

On this point Appleton[26] comments:

> Instances of this type of evidence are relatively scarce. In view of the fact that we are generally dealing with alpha streptococci and that there are many different types or groups of these organisms, it is usually difficult to prove identity even where alpha streptococci are isolated both from 'primary' and secondary lesions. The task is rendered still more difficult and the results more uncertain by reports that streptococci may change in type and serologic characteristics while in the animal body.

Coolidge lists as his three remaining points:

> 2. Bacteria injected into animals can cause lesions in distant parts of the body. The theory of elective localization, as cited by Rosenow, is now believed to be greatly overrated, but there is enough good bacteriologic evidence available to support the contention that bacteria from a primary focus can produce secondary infection in distant parts of the body.
> 3. Subjection of a primary focus to trauma may cause an acute exacerbation of a secondary focus.
> 4. Elimination of a focus sometimes causes a cure (and sometimes does not).

In this regard Holman[9] states:

> The cure of the patient after removal or treatment of a suspected focus is generally considered the most convincing evidence that the focus was the source of the infection. However, such an outcome may be due to a general tonic stimulus resulting from the removal of one cause of a lowered systemic resistance. Failure to effect a cure by these means may indicate that the focus is not the cause or that the secondary focus is well established and the damage done irreparable.

Against the importance of the concept of focal infection, these statements have been made:[26]

> 1. In spite of the wide prevalence of chronic oral infection, relatively few people show evidence of extra-oral involvement.
> 2. In many cases, removal of the primary focus is followed either by no relief of the secondary condition or by only slight or temporary relief. Proponents of the doctrine of focal infection either assert that the first objection is contrary to fact, or point out that in producing the deleterious systemic effect

or localized secondary lesions, the coincidence or cooperation of a number of conditions or factors is necessary besides the presence of a localized chronic infection.

Appleton[26] continues:

In evaluating the significance of the disappointing results obtained by the removal of the reputed primary focus, the following considerations should be kept in mind: removal of infected tissue may have been incomplete; instead of a single focus it is likely there are multiple foci; bacteria have already colonized at secondary sites, ensuring a persistence of the injurious effect; the damage done at the secondary site was already so extensive before the removal of the focus that a *restitutio ad integram* is impossible.

Furthermore, in evaluating the evidence available in regard to focal infection, it is well to keep in mind that focal infection may operate by mechanisms other than the transmission of bacteria by blood or lymph; for example, sensitization may be an important mechanism.[16]

The systemic diseases most frequently mentioned as those in whose etiology periodontal foci of infection may play a part are the rheumatic and rheumatoid diseases, subacute bacterial endocarditis, gastrointestinal diseases, ocular diseases, skin diseases and renal diseases.

Rheumatic Diseases • The "Ninth Rheumatism Review"[95] defines rheumatism or rheumatic diseases as those which can be characterized by pain and stiffness of joints, muscles or related structures. The classification recently approved by the American Rheumatism Association for inclusion in the *Standard Nomenclature of Disease* is as follows:

1. Arthritis due to specific infection.
2. Arthritis due to rheumatic fever.
3. Arthritis, rheumatoid.
4. Degenerative joint disease, multiple due to unknown cause; osteoarthritis.
5. Arthritis due to direct trauma.
6. Arthritis due to gout.
7. Neurogenic arthropathy.
8. New growths of joints.
9. Hydroarthrosis, intermittent.
10. Periarticular fibrositis.
11. Diseases in which arthritis, arthropathy or arthralgia is frequently associated. [Joint manifestation is symptom].

Of the eleven types, oral foci of infection including periodontal foci have been implicated justifiably only in the second, "arthritis due to rheumatic fever," and in the third, "arthritis, rheumatoid."[95]

Rheumatic Fever • In the literature summarized by the "Ninth Rheumatism Review,"[95] there is considerable agreement that hemolytic streptococcal infections are related to rheumatic fever but that the mechanism of action of the hemolytic streptococci remains unknown. Easlick[16] (p. 657) asserts that hemolytic streptococcal strains of bacteria are rather infrequently isolated from root canals, that, therefore, infected root canals cannot be considered as playing an important role in the initiation of rheumatic fever.

Although *Str. viridans* is considered the characteristic parasite of the human mouth,[96] *Str. hemolyticus*, among other organisms, has been isolated from diseased periodontal tissues and in small numbers from the oral cavity. Endo,[97] in culturing saliva samples from 76 patients, isolated several strains of *Str. viridans* in all cases and in some a hemolytic strain also. Rosebury[98] lists hemolytic streptococci among the flora of Vincent's infection.

Cokkinis,[99] who took gingival cultures from patients in various stages of periodontal disease, states: "Viridans was dis-

95. Hench, P. S., and others. Rheumatism and arthritis; review of American and English literature of recent years (ninth rheumatism review). Part I. Ann. Int. Med. 28:66 (Jan.) 1948.

96. Rosebury, T. Aerobic non-hemolytic streptococci. Medicine 23:249 (Sept.) 1944.

97. Kiuchi, H. Serologische Untersuchungen an Mundstreptokokken. Ztschr. f. Immunitätsforsch. u. exper. Therap. 89:535 (Dec. 31) 1936.

98. Gordon, S. M. Dental science and dental art. Philadelphia, Lea & Febiger, 1938, p. 421.

99. Cokkinis, A. J. Chemotherapy in gingivitis and pyorrhoea. Brit. M. J. (Reports of Societies) 2:1158 (Dec. 9) 1939.

covered in practically every case, sometimes in pure culture, very often mixed with nonpathogenic organisms, and in quite an appreciable proportion of cases mixed with S. hemolyticus." Rosebury[98] reviews the evidence that alpha (*Str. viridans*) and beta (*Str. hemolyticus*) transformations may occur in the body; it is indicated that *Str. viridans* could conceivably play a role in the etiology of rheumatic fever. He states, however: "The foregoing data are suggestive but need not be taken too seriously as a basis of broad implications."

A recent survey by Entine[100] reveals that 33 of 100 children ill with rheumatic fever had a nonsuppurative gingivitis. Of 100 normal children only four had gingivitis. It was not determined whether or not gingivitis was present in the experimental group prior to the onset of rheumatic fever or whether the conditions of hospitalization for this disease may have caused a predisposition to gingivitis.

It may be concluded that the evidence upholding the contention that periodontal foci of infection may play a role in the etiology of rheumatic fever is incomplete. As it was pointed out in the "Ninth Rheumatism Review,"[95] however, since the rheumatic heart lesion may be the "determinative background for bacterial endocarditis" and since, as will be shown in the section on subacute bacterial endocarditis, exacerbations of subacute bacterial endocarditis occur after dental manipulations, special consideration must be given to the rheumatic fever patient by the dentist and the physician.

Rheumatoid Arthritis • According to current theories, rheumatoid arthritis is variously claimed to be (1) an infectious disease, (2) a metabolic disease, (3) a disease with an endocrinologic basis, (4) a disease of the peripheral circulatory apparatus, (5) a disease of hypersensitivity. The "Ninth Rheumatism Review"[95] stresses the fact that although many features of the disease suggest that infection plays some part, there is no proof that rheumatoid arthritis is an infective disease. Carefully conducted attempts at cultivation of organisms from blood and joint fluids have produced negative results.

In the same review, the points for and against the theory that septic foci are of etiological importance in this disease are summarized. The points in favor of this theory include the following: (1) Streptococcal infections of the throat, tonsils or nasal sinuses may precede the initial or recurrent attacks. (2) Dramatic improvement sometimes follows removal of a septic focus. (3) The pathologic and anatomic features of lymphoid tissue in tonsillar infection, sinus infection and root abscess suggest that toxic products can be absorbed into the circulation. (4) A temporary bacteremia may occur immediately after tonsillectomy or tooth extraction and after vigorous massage of gums. Some points against this theory are: (1) Often no infectious focus can be found. (2) Usually when a focus has been extirpated, no dramatic results are produced. (3) Many persons in perfect health or suffering from a disease other than rheumatoid arthritis may have septic foci in the same situations and of the same magnitude as patients suffering from rheumatoid arthritis.

The "Ninth Rheumatism Review"[95] reports recent findings of several workers whose studies indicate some relationship between dental foci of infection and arthritis; however, they conclude: "In a word, we are still in the dark as to the cause of rheumatoid arthritis despite the enormous amount of research carried on during the past years."

For purposes of completeness, a summary of the work done regarding perio-

100. Entine, Martin. Survey of dental diseases as a diagnostic aid in rheumatic fever. J.A.D.A. 38:303 (March) 1949.

dontal foci of infection and their relationship to arthritis was made. Goadby[101] and Billings[2] were among the first workers who called attention to the relation of diseases of the gums to arthritis. Goadby reported that he was able to produce experimental rheumatism in rabbits with streptococci isolated from periodontal pockets and that by eliminating the primary focus he secured recovery in some of the severe cases. The experiments of Hartzell and Henrici[102] confirmed Goadby's results. Later, Barker[103] claimed that the majority of cases of arthritis in middle or later life are due to dental infections.

In 1930 Hench[104] stated:

> At present the indications are for radical removal of all dental and other foci in infectious arthritis. It includes thorough treatment for pyorrhea which we believe to be as potential a source of infection as infection in the ends of the roots.

In 1944, however, Boland and associates[105] reported: "our results offer no support to the idea that hemolytic streptococci may be etiologically related to rheumatoid arthritis"; thus they raised a question as to the existence of the infectious factor in this form of arthritis.

Adair[106] in 1929 emphasized the relation between pyorrhea and other diseases including rheumatism. Miller[107] reported that merely by institution of periodontal treatment success was gained in the alleviation of rheumatism and inflammatory arthritis cases which were found to be due to periodontal foci.

Cogan[108] and Sand,[87] as a result of clinical experience, maintain that "there has been established a definite relation between infectious arthritis and gingival foci of infection that may be considered primary in a fair percentage of cases." Cogan points out that arthritis may be an allergic condition due to the hypersensitivity of the joint tissue to persistent localized streptococcal infection in other parts of the body.

Comroe[109] states:

> The importance of parodontal disease (pyorrhea alveolaris) in rheumatoid arthritis has not been determined. It may be of great significance. Considering the types and frequency of bacteria in the parodontal regions, parodontal disease should receive treatment because of the general improvement in health and resistance which may follow, and possibly because of its (unproven) exciting or aggravating role in some cases of arthritis.

Later, he wrote:[110] "it has been suggested that the improvement of a patient with arthritis following removal of the primary focus may be due to a non-specific protein reaction associated with the surgery resulting in a slight fever."

Ensign,[89] writing on the subject of oral foci in chronic arthritis, declares emphatically that severe periodontal disease is a common focus. Burket in 1946[91] stated: "The frequent occurrence of bacteremias which may arise from diseased periodontal tissue, might be of more importance in the causation of joint lesions." The clinical studies of Cecil and Angevine,[36,111] however, minimize the significance of foci of infection, including dental foci, in rheumatoid arthritis. They claim that the elimination of oral foci can be expected to alter significantly only the clinical course of those forms of arth-

101. Goadby, K. W. The association of disease of the mouth with rheumatoid arthritis and certain other forms of rheumatism. Lancet 1:639 (March 11) 1911.

102. Hartzell, Thomas B., and Henrici, Arthur T. The dental path: its importance as an avenue to infection. Surg. Gynec. & Obst. 22:18 (Jan.) 1916.

103. Barker, L. F. Oral sepsis and internal medicine. J. D. Res. 2:43 (March) 1920.

104. Hench, Philip S. The treatment of dental foci in chronic rheumatic disease. D. Survey 6:19 (June) 1930.

105. Boland, E. W.; Headley, N. E., and Hench, P. S. Effect of penicillin on rheumatoid arthritis. Proc. Staff Meet., Mayo Clin. 19:505 (Oct. 18) 1944.

106. Adair, Robin. What the patient should know about pyorrhea treatment. J.A.D.A. 16:182 (Jan.) 1929.

107. Miller, Samuel C. Periodontal foci of infection. J. Periodont. 4:94 (Jan.) 1933.

108. Cogan, J. V. Relation of gingival infection to arthritis. J.A.D.A. 26:56 (Jan.) 1939.

109. Comroe, B. I. Role of the dentist in arthritis. J.A.D.A. 27:1209 (Aug.) 1940.

110. Comroe, Bernard I. Arthritis and allied conditions, ed. 2. Philadelphia, Lea & Febiger, 1941, p. 59.

111. Cecil, Russell L. The rise and fall of focal infection. Proc. Interst. Postgrad. M. A. North America (Oct. 16) 1941, p. 301.

ritis which are associated with bacterial causative factors.

Mettier,[112] in a review of the subject, states: "whereas formerly much emphasis was placed on the 'focus of infection' theory of arthritis, most rheumatologists now are of the opinion that there must be some other etiologic or precipitating factor." He adds, however, that any oral infection should be treated as a hygienic precaution in the endeavor to improve the general health of the patient.

Freyberg,[113] on the other hand, maintains that in appraising the problem of infection in relation to arthritis, the first consideration is whether the patient has arthritis or merely a condition similar to it. He says that the large number of reports of arthritis cases that improved after the removal of infected tonsils or teeth indicates that most of the patients did not have arthritis but instead some nonarticular lesion which would have improved regardless of the type of treatment. He states further that foci of infection have no relation to rheumatoid arthritis or osteoarthritis.

Kersley,[114] in discussing dental sepsis and chronic rheumatism, states:

> I would suggest that we look upon dental sepsis as the occasional trigger in firing off some biochemical mechanism which we do not as yet understand—alternatively, gross sepsis may help to sensitize the mechanism to pull off the other triggers.

After emphasizing the importance of the periodontal lesion, Boyle[93] concludes: "only in the non-specific, chronic infectious types of arthritis is there a possibility of an etiological relationship to infected teeth."

The results of studies on the alleviation of symptoms of rheumatoid arthritis with ACTH and cortisone have caused Easlick[16] (p. 660) to state:

> recent research has made most difficult the acceptance of any theory which ascribes the origin of this disease to dental focal infection unless such focal infection can be incriminated in the development of the alarm reaction reviewed by Selye.[115]

In spite of the conflicting evidence, in the "Primer on the Rheumatic Diseases"[116] dental care and the removal of obvious foci of infection are advocated as part of the treatment of patients with rheumatoid arthritis, but not, however, with the expectation of alleviating the rheumatoid arthritis.

Subacute Bacterial Endocarditis • Although some controversy exists, there is overwhelming evidence in support of the thesis that there is a causal relationship between oral sepsis and subacute bacterial endocarditis.

In regard to the relationship between oral sepsis and cardiac conditions, Willius,[117] cardiologist at the Mayo Clinic, asserted in 1940: "I can, I believe, safely state, that in our present concept this problem virtually narrows itself down to subacute bacterial endocarditis."

From his review of the literature, Easlick[16] (p. 667) concludes "that the viridans streptococci most frequently are associated with subacute bacterial endocarditis."

In 1935, Okell and Elliott,[51] as a result of blood culture studies of patients with subacute bacterial endocarditis, declared:

> Practically all observers are agreed that the vast majority of endocarditis streptococci are of the salivary or *Str. viridans* type. These abound in the mouth and its neighborhood but

112. Mettier, S. R. Classification and treatment of the rheumatic diseases with special emphasis on infectious and rheumatoid arthritis. Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.) 32:440 (Aug.) 1946.

113. Freyberg, R. H. "Focal infection" in relation to rheumatic diseases: a critical appraisal. J.A.D.A. 33:1101 (Sept.) 1946.

114. Kersley, G. D. Dental sepsis and chronic rheumatism. Proc. Roy. Soc. Med., Sec. Odont., 42:151 (March) 1949.

115. Selye, H. The general adaptation syndrome and the diseases of adaptation. J. Clin. Endocrinol. 6:117 (Feb.) 1946.

116. American Rheumatism Association. Primer on the rheumatic diseases. J.A.M.A. 139:1139 (April 23) 1949.

117. Austin, L. T. Relationship of dental sepsis to systemic disease. J.A.D.A. 27:684 (May) 1940.

are only found elsewhere in small numbers and under exceptional conditions, above all it is in conditions of oral sepsis such as pyorrhea of the gums that this type of streptococcus is found in the greatest number.

Further evidence of this relationship between oral sepsis and subacute bacterial endocarditis was presented recently by Christie[118] and Selbie, Simon and Robinson.[119] Christie, after analyzing 269 cases of subacute bacterial endocarditis, stressed the importance of foci of infection in the mouth as the potential source of *Str. viridans* bacteremia. Selbie and his co-workers, enlarging on the work of Elliott, proved by serological methods that the organism of subacute bacterial endocarditis is invariably derived from the region of the mouth but not necessarily from a focus of infection in the mouth.

Cases of subacute bacterial endocarditis after tooth extraction and manipulation of infected teeth and gums have been reported by many workers. Rushton,[120] reviewing 40 cases of subacute bacterial endocarditis, found that 28 of the 40 had some degree of dental sepsis. He reports also four cases in which subacute bacterial endocarditis followed tooth extraction. Abrahamson[63] reports two cases in which an attack of subacute bacterial endocarditis, leading to death, occurred after the removal of septic teeth. Fulton and Levine[121] cite four instances in which patients dated the onset of symptoms of subacute bacterial endocarditis as shortly after the removal of septic teeth; in two other instances the symptoms seemed to be aggravated definitely by this procedure. Vanderhoof and Davis[61] report two cases of fatal illness in which subacute bacterial endocarditis followed extraction of infected teeth. Weiss[122] reports 10 cases, Elliott[50] 13 cases and Sale[123] three cases of subacute bacterial endocarditis following extraction. Feldman and Trace[52] report five cases and Palmer and Kempf[53] report four cases of death from *Str. viridans* bacteremia following tooth extraction or periodontal treatment. Paquin[69] mentions the epithelial junction of the gingival tissues and the crown of the tooth as one portal of entry for *Str. viridans* in cases of subacute bacterial endocarditis. He cites a case of subacute bacterial endocarditis, which occurred after an extraction and which led to death. Biocca and Seppilli[124] report two fatal cases of subacute bacterial endocarditis caused by lactobacilli. One case followed surgical drainage of an oral abscess and the other the extraction of a tooth.

Geiger,[54] in studying the case histories of 50 patients with proved subacute bacterial endocarditis, found that symptomatic beginning of the fatal infection was specifically mentioned in 12 instances as closely following extraction. In five other cases some form of oral sepsis existed. Bay[125] found that out of 26 patients with subacute bacterial endocarditis six had a history of dental extraction during the month before the onset of the disease. Barnfield[66] reports six out of 92 cases of subacute bacterial endocarditis which were associated with extraction. In addition, he cites Thayer who believed that periodontal sepsis is one of the ways by which streptococci gain entrance into

118. Christie, R. V. Penicillin in subacute bacterial endocarditis; report to Medical Research Council on 269 patients treated in 14 centres appointed by Penicillin Clinical Trials Committee. Brit. M. J. 1:1 (Jan. 3) 1948.

119. Selbie, F. R.; Simon, R. D., and Robinson, R. H. M. Serological classification of viridans streptococci from subacute bacterial endocarditis, teeth, and throats. Brit. M. J. 2:667 (Sept. 24) 1949.

120. Rushton, M. A. Subacute bacterial endocarditis following extraction of teeth. Guy's Hosp. Rep. 80:39 (Jan.) 1930.

121. Fulton, M. N., and Levine, S. A. Subacute bacterial endocarditis with special reference to valvular lesions and previous history. Am. J. M. Sc. 183:60 (Jan.) 1932.

122. Weiss, H. Relation of portals of entry to subacute bacterial endocarditis. Arch. Int. Med. 54:710 (Nov.) 1934.

123. Sale, Llewellyn. Some tragic results following extraction of teeth. II. J.A.D.A. 26:1647 (Oct.) 1939.

124. Biocca, E., and Seppilli, A. Human infections caused by lactobacilli. J. Infect. Dis. 81:112 (Sept.-Oct.) 1947.

125. Bay, E. B. Teeth as a portal of entry for systemic disease, especially subacute bacterial endocarditis. Ann. Den. 3:64 (Sept.) 1944.

the blood stream and who pointed out that 40 per cent of his 77 cases of subacute bacterial endocarditis had periodontal or periapical involvement.

Kelson and White[126] in 1945 reported a study of a series of 250 well substantiated cases of subacute bacterial endocarditis, in which the most common predisposing cause of illness, excluding grippe, was some dental procedure, especially extraction. They estimate that one in each four cases of subacute bacterial endocarditis gave such a history. Kolmer[127] found that many cases of subacute bacterial endocarditis could be ascribed to local infections of dental origin especially to periodontitis and to poor oral hygiene.

Rhoads[128] asserts:

> A rekindling of interest in focal infection would also do much in the prevention of subacute bacterial endocarditis. . . . Foci should be eliminated before they have acted over a long period as sensitizing foci from which bacterial toxins are spread or as atriums from which bacteria are disseminated into the blood stream.

He advocates removal of foci under the protection of antibiotic therapy. Budnitz, Nizel and Berg[72] believe that the transient bacteremia occurring after tooth extractions has no or very little permanent effect on persons in good health and without heart disease. "However," they add, "if a valvular or congenital cardiac defect exists, the soil is fertile for the implantation and superposition of the bacteria, and SBE may result." Rhoads,[128] as a result of his work, is in agreement with Budnitz and asserts:

> some property of the valve lesions in subacute bacterial endocarditis protects the causative organism from the ordinary sterilizing influence of humoral antibodies and phagocytes and to a great extent from all forms of chemotherapeutic and antibiotic agents. Hence, once established, the vegetations continue to grow.

He advocates the use of antibiotics as a prophylactic measure. In 1945 Matthew and Gilchrist[129] in a series of 40 cases of subacute bacterial endocarditis found that there was a history of dental extractions within three months prior to the onset of the disease in 35 per cent of the cases. In 48 per cent of the sufferers oral sepsis was present.

Scheifley[130] of the Mayo Clinic department of internal medicine declares: "I would state that the opinion is unanimous among physicians that dental infection is frequently a cause of SBE and is always a hazard in patients who have valvular and congenital heart lesions."

In summarizing the data pertaining to the possible relationship between periodontal foci of infection and subacute bacterial endocarditis, the following points seem the most pertinent:

1. *Str. viridans* has been shown to be the organism most frequently associated with subacute bacterial endocarditis.

2. *Str. viridans* is the most common organism in the oral cavity and is present in all mouths regardless of the presence of infection.

3. Simple manipulations of gingival tissue such as massage have led to *Str. viridans* bacteremia. The presence of periodontal disease has been shown to accompany an increase in the incidence of bacteremia.

4. It has been demonstrated that organisms found in the pulps of extracted teeth as well as in the blood stream after extraction are derived from the gingival crevice and that attempts at sterilization of the gingival crevice result in a decrease in bacteremia.

126. Kelson, S. R., and White, P. D. Notes on 250 cases of subacute bacterial (streptococcal) endocarditis studied and treated between 1927 and 1939. Ann. Int. Med. 22:40 (Jan.) 1945.

127. Kolmer, J. A. Medicine in relation to dentistry. Ann. Den. 7:39 (June) 1948.

128. Rhoads, P. S. Subacute bacterial endocarditis; etiologic considerations and prophylaxis. M. Clin. North America 32:176 (Jan.) 1948.

129. Matthew, H., and Gilchrist, A. R. Subacute bacterial endocarditis and its treatment with penicillin. Tr. Med.-Chir. Soc. Edinburgh, p. 25, 1948-1949, in Edinburgh M. J. 56 (March) 1949.

130. Scheifley, N. C. Personal communication, 1951.

5. Extractions of infected teeth and manipulations of infected gingivae have been linked with *Str. viridans* bacteremia and with associated subacute bacterial endocarditis.

Gastrointestinal Disease • Most of the work reported which relates to the role of periodontal foci of infection in gastrointestinal disease was done prior to 1930, and in many cases the results are questionable.

Rosenow[131] found that intravenous injection of streptococci of a certain grade of virulence may be followed by ulcers of the stomach and duodenum. He states:

> the supposed relation between infected tonsils or gums and gastric ulcer may be due not to swallowing of bacteria but to entrance into the blood of streptococci of the proper kind of virulence to produce local infection in the wall of the stomach.

As Holman[9] and Reimann and Havens[15] later pointed out, Rosenow's work can be criticized on many grounds, including these: the lack of adequate controls, the lack of standardization in the experimental procedures and the use of nonphysiological doses for the experimental animals.

Cook[132, 133] found that the streptococci isolated from deep pockets and from infected investing tissues of the mouths of patients who had advanced periodontal disease were similar in type to those isolated from the colons of those same patients who were suffering also from ulcerative colitis. Haden[134] states that digestive disturbances may result from the swallowing of products of infection about the teeth and that these products occur principally in cases of advanced periodontal disease. He adds, however, that most disturbances of the alimentary tract due to dental infections are hematogenous in origin.

Goldstein[135] found profuse dental infection in a series of 355 cases in which a diagnosis of gastric carcinoma had been made. Periapical involvement and periodontal pathology were found in 80.2 per cent, whereas in a control series of the same number of patients of approximately the same age the incidence was 44.5 per cent. In this study one might question which was the cause and which the effect.

Meyer[136] states:

> In pyorrhea alveolaris especially, even if there is no direct invasion of the blood or lymph stream, the constant swallowing of the purulent secretion may cause functional derangement of the stomach and duodenum, first, as a diminished hyperchlorhydria and finally as a diminished chlorhydria, pylorospasm and cardiospasm; this, continued, causing organic disease such as duodenitis, duodenal ulcer, gastritis and peptic ulcers.

As Easlick points out[16] (p. 625), the high acidity of the gastric juice is a strong defense against any bacteria swallowed with the saliva; therefore the hematogenous route would be the only possible route. Nevertheless, in view of the fact that the acidity of the gastric juice varies greatly among individuals and within the same individual during different periods, it is conceivable that bacteria swallowed could do damage.

Austin[117] in 1940 quoted George B. Eusterman, senior consultant, section of gastroenterology, Mayo Clinic, as saying,

> I don't see how any conscientious practitioner or specialist, in the light of present knowledge, can ignore the importance of dental infection in the presence of disorders or disease of the upper part of the digestive tract.

131. Rosenow, E. C. The production of ulcer of the stomach by injection of streptococci. J.A.M.A. 61:1947 (Nov. 29) 1913.

132. Cook, Thomas J. Periodontoclasia: the relation of diseases of the periodontium to systemic disease. J.A.D.A. 17:880 (May) 1930.

133. Cook, Thomas J. Focal infection of teeth and elective localization in the experimental production of ulcerative colitis. J.A.D.A. 18:2290 (Dec.) 1931.

134. Haden, Russell L. A survey of systemic disturbances traceable to infected teeth. J.A.D.A. 17:2015 (Nov.) 1930.

135. Goldstein, Harold. A dental perspective of three hundred fifty-five cases of gastric carcinoma. J.A.D.A. 18:2368 (Dec.) 1931.

136. Meyer, Karl A. Oral infection and gastro-intestinal disease. J.A.D.A. 27:93 (Jan.) 1940.

It may be concluded that the evidence pertaining to a relationship between periodontal foci of infection and gastrointestinal disease is questionable and incomplete.

Ocular Diseases • Woods[137] in a comprehensive article dealing with the problem of focal infection and eye diseases states: "There is a mass of clinical evidence consisting of careful studies on the etiology of uveal-tract disease and case reports illustrating the recovery of the diseased eye on removal of foci of infection." He considers the mass of evidence so formidable that "it is difficult to dismiss it lightly on the sole grounds that it is only suggestive evidence." He cites a number of reports upholding the above contention but warns that in interpreting such clinical data one should keep in mind that: (1) complete information from which the cases reported are drawn is not given: (2) some one fact believed to be of importance is emphasized, and a comprehensive picture of possible etiology is not supplied; (3) deductions as to the relative importance of focal infection compared with other possible etiological factors are usually not valid.

With regard to the third point, he compares two studies made 20 years apart, which show the gradual change of opinion in respect to the relative importance of tuberculosis and focal infection in ophthalmology. Irons and Brown[138] in 1916 and in 1923 reported 200 cases of iritis in which 4 per cent could be attributed to tuberculosis and 72 per cent to focal infection. In 1940 in an analysis of 562 cases of iritis better diagnostic procedures enabled Guyton and Woods[139] to attribute 49.7 per cent of these cases to tuberculosis and only 26.1 per cent to focal infection. In a more recent study Guyton and Woods[139] noted that the percentage of cases ascribed to focal infection had decreased from 26.1 per cent to 5.5 per cent. Woods,[137] judging from a review of the literature, does not believe that the direct metastasis of bacteria from the primary to secondary focus is an important mechanism as far as eye disease is concerned. Nevertheless, as a result of the work on sensitization by Derick, Hitchcock and Swift,[140] Schultz and Swift,[141] and others, he concludes:

> It is apparent that there is a quite reasonable experimental basis for the supposition that primary foci of infection may be related to secondary ocular inflammation through a mechanism of sensitization and intoxication from the primary focus.

In view of the fact that the preceding mechanism is compatible with the theory of focal infection, it is important to review the literature pertaining to periodontal foci and eye disease. B. T. Lang[142] in 1913 classified 71 out of 176 cases of eye infections as due to foci around the teeth. Black[143] in 1915 stated that he believed that fully 50 per cent of all adults have oral infection, either periapical alveolar abscesses or chronic suppurations beginning at the gingival margin and that it is the duty of every ophthalmologist at least to consult the dentist in case of ocular lesions in which foci of infection may be either the sole or a contributing factor in etiology. In 1928 Rosenow[144] tried to provide experimental evidence of the causal rela-

137. Woods, A. C. Focal infection. Am. J. Ophth. 25:1423 (Dec.) 1942.

138. Irons, E. E., and Brown, E. V. L. The etiology of iritis. J.A.M.A. 66:1840 (June 10) 1916; 81:1770 (Nov. 24) 1923.

139. Guyton, J. S., and Woods, A. C. Etiology of uveitis; clinical study of 562 cases. Arch. Ophth. 26: 983 (Dec.) 1941.

140. Derick, C. L.; Hitchcock, C. H., and Swift, H. F. Reactions of rabbits to non-hemolytic streptococci: a study of modes of sensitization. J. Exper. Med. 52:1 (July) 1930.

141. Schultz, M. P., and Swift, H. F. Reaction of rabbits to streptococci: comparative sensitizing effect of intracutaneous and intravenous inocula in minute doses. J. Exper. Med. 55:591 (April) 1932.

142. Lang, B. T. The influence of septic infection in the causation of eye disease. Brit. M. J. 1:381 (Feb. 22) 1913.

143. Black, Arthur D. Ocular diseases resulting from dental lesions. Ophth. Record 24:610 (Dec.) 1915.

144. Rosenow, Edward C. Focal infection and elective localization in the pathogenesis of diseases of the eye. Am. J. Surg. 48:83 (Feb.) 1928.

tionship between oral sepsis and ocular disease. As it was stated previously, these results have been questioned. In 1913 William Lang[145] reported that advanced periodontal disease was responsible for 139 out of 215 cases of eye infections. In 1929 also, Stafne and Cook[146] after some bacteriological studies reported that there is an etiological relationship between periodontal infection and some eye diseases. In 1930 Gillett[147] made the following conclusions from a study of case histories:

> 1. Any variety of foci in the mouth may be a cause of disease of the eye. 2. The lymph and blood circulation of the tooth pulp and periodontal tissues suggest that this is the path by which infection from foci in the teeth reaches the eye.

Ellett[148] in 1932 stated:

> In the case of open sepsis, of which pyorrhea is a good example, the infection may occur by direct extension, as in lacrimal disease, inflammation of the conjunctiva and lid margins, corneal ulcer and orbital cellulitis.

Moser[149] later mentioned five instances of acute iritis associated with chronic Vincent's infection which cleared up after the mouth lesions were treated. Kirby,[150] Bacchi and LaRocca[151] and MacCallan[152] claim that oral sepsis including periodontal disease has a relation to many ocular diseases. W. L. Benedict, quoted by Austin,[117] states that "Attacks of eye disease from dental sepsis may be of any degree of severity."

In 1944, Ubaldo and de Ocampo[153] reported the effectiveness of periodontal treatment in a case of neuroretinitis where extensive constitutional therapy brought no improvement. Removal of dental foci resulted in progressive improvement of vision. Spaeth[154] in 1945 stated that he believed that more emphasis should be placed on the role of gingivitis in ocular disease; he declared: "We as ophthalmologists, do not only grant an interrelationship between dental infection and eye disease, we insist upon the presence of such an inter-relationship." Burket[91] cites periodontal pockets as oral foci of infection that may be associated with eye lesions.

From the foregoing the following conclusions can be reached:

(1) Some eye diseases have been attributed to focal infection; however, thorough studies determining this relationship have not been accomplished.

(2) If a relationship between eye disease and focal infection does exist, the most probable mechanism is sensitization.

(3) Periodontal foci of infection can be considered as possible sources of organisms for the allergic process.

Skin Diseases • In 1949 Fox and Shields[155] listed the 10 most common dermatoses seen in practice; while implicating focal infection only in urticaria, they advised surgical intervention as the last of the investigative procedures in the evaluation of chronic urticaria. Ormsby and Montgomery[156] state: "That focal infection plays a part in the causation of cutaneous disease is certain, but

145. Lang, William. The influence of chronic sepsis upon eye disease. D. Surg. 9:305, 1913.

146. Stafne, Edward C., and Cook, Thomas J. Bacteriologic study of pyorrhea alveolaris. D. Cosmos 71:115 (Feb.) 1929.

147. Gillett, H. W. Infections of the mouth and their relation to diseases of the eye, from point of view of general practitioner of dentistry. Arch. Ophth. 4:228 (Aug.) 1930.

148. Ellett, E. C. Relation of focal infections of the teeth to ophthalmologic conditions. J.A.D.A. 19:784 (May) 1932.

149. Moser, G. P. Iritis and other symptoms caused by chronic Vincent's infection of the mouth. Am. Med. 41:560 (Nov.) 1935.

150. Kirby, D. B. Dental infection and the eye. Ann. Den. 6:65 (June) 1939.

151. Bacchi, J. G., and LaRocca, V. Relations between corneal ulcers and diseases of the mouth. D. Digest 46:15 (Jan.) 1940.

152. MacCallan, A. F. Eye affections caused by dental disease. D. Mag. & Oral Topics 49:255 (March) 1932.

153. Ubaldo, A. R., and de Ocampo, G. Concept of focal infection in ophthalmology. J. Philippine M. A. 21:443 (Sept.) 1944.

154. Spaeth, Edmund B. Ophthalmology and dentistry. Penn. D. J. 12:278 (May) 1945.

155. Fox, E. C., and Shields, T. J. Résumé of skin diseases most commonly seen in general practice. J.A.M.A. 140:763 (July 2) 1949.

156. Ormsby, O. S., and Montgomery, H. Diseases of the skin, ed. 7. Philadelphia, Lea & Febiger, 1948.

the number of such diseases and the extent of their role has not been determined."

Sutton and Sutton[157] include periodontal disease as a focus in which "a persistent nest" of pathogenic microorganisms may reside which, occasionally escaping from the focus, may provoke or abet or complicate cutaneous diseases. The dermatoses frequently related with periodontal disease as a focus of infection are listed by them as sycosis barbae, lupus erythematosus, lichen planus, pustular acrodermatitis and chronic ulcer of the leg. They state further: "there are cases of chronic, recurrent pustular dermatitis particularly of the hands and feet, which can be cured only after foci of infection, especially oral foci, have been eradicated." Several workers have reported cases of Vincent's infection associated with erythema multiforme.[158-162]

Although definite proof is lacking, it may be concluded that dental foci including periodontal foci may play a role in the etiology of some dermatoses. As in the case of the eye diseases the most probable mechanism is sensitization.

Renal Disease • Easlick[16] (p. 674), after reviewing the literature on the etiology of infections of the urinary tract, concludes: "From the preceding review, it would appear that the colon bacteria most frequently have been implicated in the infections of the urinary tract." Staphylococci and streptococci also, however, were cultured from urine samples of patients with these infections. Easlick stresses the point that it is the *Str. hemolyticus*, rarely cultured from root canals, which is most commonly involved in kidney infections; hence he does not consider dental infections important in the etiology of renal disease.

Hayman[163] asserts: "Infections of the kidney may be caused by almost any organism, but more than half of them are due to *Escherichia coli*. Next in frequency are staphylococci and streptococci." In speaking of acute glomerulonephritis, Hayman states: "although the etiology of acute glomerulonephritis remains unproven, all recent studies indicate clearly that there is a close relationship between certain infections and the onset of the disease." He implicates infections of the upper respiratory tract as being the most frequent kind preceding the attack.

Stumpf[164] cites a case in which the removal of dental foci led to improvement of a nephritic condition. Fish[9] believes that in the case of focal infection, derangement of kidney function ultimately results, since it is the kidneys which have to eliminate the toxins elaborated at the focus.

The evidence showing a relationship between periodontal disease and renal disease is incomplete and not suggestive.

Miscellaneous Diseases •

Lung Diseases • In 1932 Cecil[165] commented on the prevalence of lung abscesses and bronchiectasis in patients with poor oral hygiene and stated that these lesions are caused in part by fusospirochetes, which are usually present in the mouth but are especially prevalent in periodontal disease. Smith[166] lists a total

157. Sutton, R. L., and Sutton, R. L., Jr. Handbook of diseases of the skin. St. Louis, C. V. Mosby Co., 1949.

158. Caskey, C. R. Vincent's angina associated with unusual skin manifestations. J. Urol. & Cutan. Rev. 36:370 (June) 1932.

159. Crance, A. M. Vincent's disease associated with erythema multiforme-like eruption; report of case. Arch. Dermat. & Syph. 28:508 (Oct.) 1933.

160. Chick, F. E., and Witzberger, C. M. Erythema multiforme exudativum accompanying oral Vincent's infection. Am. J. Dis. Child. 55:573 (March) 1938.

161. Rosenberg, L., and Rosenberg, J. Erythema exudativum multiforme (Hebra) with conjunctivitis and stomatitis. Arch. Dermat. & Syph. 41:1066 (June) 1940.

162. Morrison, J. P. A case of Vincent's infection associated with erythema multiforme. J.A.D.A. 28:1938 (Dec.) 1941.

163. Cecil, R. L., and Loeb, R. F. Textbook of medicine. Philadelphia, W. B. Saunders Co., 1951, p. 964.

164. Stumpf, Franz Wilhelm. Significance of nephritis to the dentist. D. Items Interest 59:449 (May) 1937.

165. Cecil, R. L. Bacteriology of dental infections and its relation to systemic disease. New York State J. Med. 32:1242 (Nov. 1) 1932.

166. Smith, David T. Oral spirochetes and related organisms in fuso-spirochetal disease. Baltimore, Williams & Wilkins Co., 1932, p. 83.

of 46 cases of lung abscesses which followed extraction of teeth and which, in his opinion, were caused by aspiration of blood mixed with fusospirochetal material.

King and Lord[167] found that in 12 per cent of 227 cases of lung abscess the abscess developed after the extraction of teeth. Grace[168] in 1940 showed a definite clinical relationship between the incidence of periodontal disease and lung abscesses occurring after general anesthesia.

Presumably, the most obvious mechanism for transmission of oral organisms to the lung is aspiration, which may or may not be considered as a mechanism of focal infection.

General Malaise • Although general malaise is not considered a disease entity, it is listed for purposes of completeness. Sweigert, Gobar and Bartlett[169] found that symptoms, not related to any known chronic condition, of about 75 per cent in one group of patients were alleviated after surgical treatment of periodontal disease. Willinger[170] cites a case of a woman with neurological symptoms and general malaise, whose roentgenograms revealed generalized periodontal disease as well as an impacted upper left cuspid. When these two conditions were improved, the patient's general condition also was greatly improved.

The evidence relating periodontal disease to lung disease, prostatic disease or general malaise is incomplete and, at most, merely suggestive.

DISCUSSION

Logically, from an anatomical and physiological point of view, periodontal foci of infection and periapical foci of infection should be considered together when the problem of focal infection is discussed. Since the relation of periapical foci to systemic disease has already been reviewed extensively by Easlick, however, this paper was concerned mainly with the periodontal foci; naturally, some overlapping of material, especially in regard to the problem of focal infection in general, was unavoidable.

From a thorough review of the literature the fact emerges that periodontal disease is indeed as important as periapical infection in its relationship to systemic disease. Sufficient evidence has been accumulated to show also that transient bacteremia results from simple dental manipulations, such as massage and chewing, as well as from extensive oral surgery. In addition, there is strong evidence to indicate that the presence of oral sepsis increases the incidence of bacteremia. The crux of this problem can be expressed in one question: Does transient bacteremia cause or aggravate systemic conditions?

A large number of reports has been published, linking oral sepsis with a great variety of diseases mostly of an infectious nature. The reports from 1910 to 1930 have not been accepted as definite proof because the evidence is based largely on subjective interpretations of clinical signs, often without controls. Furthermore, most of the experimental proof available during this period was published at a time when bacteriological technics were crude, when the etiology of many diseases was obscure and before modern roentgenographic technics and other diagnostic measures were used. This proof is therefore largely questionable and cannot be interpreted universally.

The more recent reports of carefully controlled studies link oral manipulations

167. King, D. S., and Lord, F. T. Certain aspects of pulmonary abscess from analysis of 210 cases. Ann. Int. Med. 8:468 (Oct.) 1934.

168. Grace, E. J. Anaerobic hemotoxin-producing streptococci in pyorrhea and lung abscess. J.A.D.A. 27:1481 (Sept.) 1940.

169. Sweigert, Charles F.; Gobar, I. C., and Bartlett, Alexander G. Effects on the general health of treatment of paradental disease by surgery. J.A.D.A. & D. Cosmos 24:698 (May) 1937.

170. Willinger, Louis. Dental foci of infection. D. Survey 25:1144 (Aug.) 1949.

and bacteremias with exacerbations of such diseases as subacute bacterial endocarditis. These reports together with others on the prevention of bacteremias by means of antibiotics have prevented the theory of focal infection from being a dead issue. Furthermore, some of the new theories on sensitization and allergic reactions are entirely compatible with the postulated mechanisms of focal infection.

Certain factors that should be considered in proving or disproving the theory of focal infection have been summed up by Ensign[89] thus:

> Much of the apparent confusion and muddled thinking on the subject of focal infection have their basis in several facts: First, there is no clear-cut proof of the mode of action of a focus of chronic infection in causing disease at a distance. In some instances, metastasis of bacteria seems to occur; in others, the absorption of toxic products is thought to be important; while in others, the existence of a state of allergy is postulated. A second fact is that many, perhaps most, of the conditions in which focal infection has been thought to play a part are diseases, the exact etiology of which is still uncertain or unknown. Thirdly, some still fail to differentiate between cause and effect, between early changes and organized tissue changes; and the failure of the established disease to be modified by eradication of a focus is unjustly held to be evidence against the original influence of the focus in initiating such changes. A fourth source of confusion consists in the making of general statements, rather than in confining observations to one disease or one group of diseases.

Since so much confusion exists, there is no doubt that further clinical and experimental research, scientifically controlled, is necessary before the theory of focal infection can be accepted, modified or rejected.

In the meantime, as long as bacteremia does result from oral manipulations in the presence of oral sepsis and since bacteremia has been known to be detrimental to some patients and potentially dangerous to others, especially those with cardiac damage, it would be folly to tolerate oral sepsis. This conclusion does not imply that an oral focus should be regarded as "anything readily accessible to surgery"[8] but rather that established oral foci, periapical and periodontal, should be treated, irrespective of their relation to extraoral or systemic damage, and that in an effort to prevent bacteremia precautionary measures should be taken prior to manipulations. Furthermore, since bacteremia does occur in individuals with no apparent foci of infection, precautionary measures should always be taken with all patients who have a history of rheumatic fever or valvular heart disease such as subacute bacterial endocarditis or a congenital defect.

Participation in Public Health • Public health programs should be so organized that the people who have the problems are given an opportunity to plan and contribute to the solution. Too often there is little participation by the individual, who passively receives the services. In a sense, health officials should aim to make every citizen a public health worker, at least in his own behalf. *Joseph W. Mountin, Public Health Reports, April, 1952.*

American Dental Association specification no. 12 for denture base resin: second revision

Aubrey C. Sweaney, A.B.; George C. Paffenbarger,* D.D.S.; Harold J. Caul,* B.S., and W. T. Sweeney,† A.B., Washington, D. C.*

For the past 15 years the polyesters of acrylic acid, substituted acrylic acids and copolymers of these resins with the vinyl esters have predominated in plastics used for denture bases. The most widely used of these resins is polymethyl methacrylate of both the heat-curing and the self-curing types. Because the important new self-curing resins have been introduced, the current American Dental Association Specification No. 12 for Denture Resin[1] has been changed to include this type of resin.

PROPOSED CHANGES

The format of the Specification has been changed to conform more nearly to the standard outline of form for federal specifications.[2] The specific changes proposed in the revision arise largely from the need for clarifying and simplifying the tests, a need indicated by experience gained over the past 12 years during which this specification has been in effect. These changes, together with reasons for change, include the following:

I. *Dimensional Drawings of Apparatus and Specimens* • Detailed drawings of specimens and of apparatus and descriptions of the procedures presented will enable manufacturers to check their methods of routine production control against the standard procedures of the Specification.

II. *Mixing and Packing Characteristics (4.3.1)*[3]

A. Mixing Temperature (4.3.1.1) • The temperature of mixing the resin is specified at 23° ± 1°C. (71.6° ± 1.8°F.). At present, approximately 80 per cent of the directions for the certified resins[4] prescribe room temperature. Since room temperatures vary, a specific temperature is needed for testing purposes. This change will simplify the testing procedures by eliminating the time-consuming methods required to heat and hold the resins at the different mixing temperatures now proposed by some manufacturers. The data in Table 1 show that resins for which a higher mixing temperature is recommended do not have a

The publication of this revision was authorized by the National Bureau of Standards and the Council on Dental Research of the American Dental Association. The revision will be presented to the Board of Trustees of the American Dental Association at its February 1953 meeting; if passed, it will become effective July 1, 1953.

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1. Revised American Dental Association specification no. 12 for denture base material, acrylic resin or mixtures of acrylic and other resins (effective January 1, 1942). J.A.D.A. 29:127 (Jan.) 1942.

2. Outline of form and instructions for the preparation of federal specifications (21 October 1947). Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

3. Numbers in parentheses refer to sections of the revised Specification. Figures numbered with Roman numerals appear in the revised Specification; those with Arabic numerals in the explanatory section.

4. American Dental Association Council on Dental Research, List of certified dental materials revised to March 1, 1951. J.A.D.A. 43:78 (July) 1951.

higher transverse strength than other resins mixed at room temperature; consequently, the resin should be designed to give a proper mix at room temperatures.

B. Mixing Time (4.3.1.1) • The time at which the resin dough is ready for packing is defined as that time when the resin separates cleanly from the walls of the mixing jar. Heretofore the rather vague term "suitable plasticity" was used to indicate the proper time to pack. Timing according to the new definition will prevent premature packing of the powder-liquid class resin and thus will eliminate one of the causes of porosity.[5]

C. Packing Test (4.3.1.2) • The packing test, a means of determining stiffness of the dough, is delayed 5 minutes after the proper packing time has been reached to assure that the resin remains plastic for 5 minutes. This delay will allow sufficient time to pack the flask properly. The brass die (Fig. 1) used for this test has been changed to a simpler form than that used previously. No. 69 drill is the correct size for holes 0.75 mm. (0.029 in.) in diameter. The resin is considered suitable for packing if it is intruded into at least two of the holes to a depth of not less than 0.5 mm. (0.02 in.) when under a 5,000 Gm. (11 pound) load. The air space between the bottom of the die and the surface on which it rests prevents an airlock during the test.

III. *Standard Processing Technic (4.3.2)* • A standard processing method for Type I, Class 1 and 2 resins is adopted to simplify and standardize dental technics. At present approximately 40 different recommended procedures or instructions for processing are given by the manufacturers for the various resins on the List of Certified Dental Materials.[4] Furthermore, many of these instructions are not stated clearly; and they are also unnecessarily complicated. Often several different procedures are suggested for the same brand of resin. In some instructions even the use of a vulcanizer is suggested. The number and the frequent complexity of these technics are unwarranted.

Table 1 • Transverse strength of denture resins*

Brand	Temperature of mixing	Breaking load
	°F.	Gm.
A	130	6,000
B	72	6,300
C	130	6,400
D	99	6,600
E	72	7,000
F	122	6,600

*Specimens cured according to manufacturer's directions and tested as specified in section 4.3.5 of the second revision of the specification herein printed.

IV. *Water Sorption and Solubility (4.3.3 and 4.3.4)* • The method of conditioning the specimens to constant weight is changed from drying in air at 75°C. (167°F.) to drying over a desiccant (anhydrous calcium sulfate) maintained at 37°C. (98.6°F.). This change is made because these resins in service are subjected primarily to mouth temperature, 37°C. (98.6°F.), and not to continued high temperatures such as 75°C. (167°F.). This is necessary also because the self-curing resins should not be subjected to the 75°C. environment on account of the possibility of polymerization beyond that encountered in the clinical use of the resin.

Since removal of water by a desiccant is slower than by heating, it was necessary to reduce the thickness of the water sorption and solubility specimen from 1.0 to 0.5 mm. in order to maintain the same testing time. When the thin specimens (0.5 mm.) were made in tin-foil-lined gypsum molds, they were usually wedge-shaped and consequently unsatisfactory. To produce specimens 0.5 ± 0.1 mm. thick, the stainless steel mold shown

5. Sweeney, W. T.; Paffenbarger, George C., and Beall, John R.: Acrylic resins for dentures. J.A.D.A. 29:7 (Jan.) 1942.

Table 2 • Sorption and solubility tests on denture resins

Resin	Specimen: Thickness, mm.	Specimen: Mold	Conditioning	Sorption, mg./cm.²	Solubility, mg./cm.²
Heat curing*					
	1.0†	Tin-foiled gypsum§	Air oven 75°C.	0.76	0.002
	0.5‡	Tin-foiled gypsum§	Desiccator 37°C.	0.65	0.010
	0.5‡	Steel die§	Desiccator 37°C.	0.62	0.008
Self curing*					
	1.0†	Tin-foiled gypsum‖	Air oven 75°C.	0.72	0.041
	0.5‡	Steel die‖	Desiccator 37°C.	0.48	0.039

*One package of one brand.
†Tested in accordance with current A.D.A. Specification No. 12.
‡Tested in accordance with Sections 4.3.3 and 4.3.4 of A.D.A. Specification No. 12, Second Revision as given in this report.
§Mixed and processed according to standard technic (4.3.2.).
‖Mixed and processed according to manufacturer's directions.

in Figure III was developed. This mold is designed so that the excess resin dough is expressed into the outside well or spillway and only a very thin flash of uniform thickness is attached to the specimen.

The data in Table 2 present a comparison of the results of water sorption and solubility tests for two sizes of specimens: (1) 1 mm. thick, formed in tin-foil-lined gypsum molds and conditioned in air at 75°C. (167°F.) and (2) 0.5 mm. thick, formed either in a stainless steel mold or in a tin-foil-lined gypsum mold and conditioned at 37°C. (98.6° F.) over a desiccant (anhydrous calcium sulfate). No significant difference is shown in the results obtained on specimens prepared by the two methods listed for the 0.5 mm. specimens. The data obtained by the two different methods show that the thickness of the specimen and the method of conditioning do affect the values significantly.

Figure 1 shows the effect on the

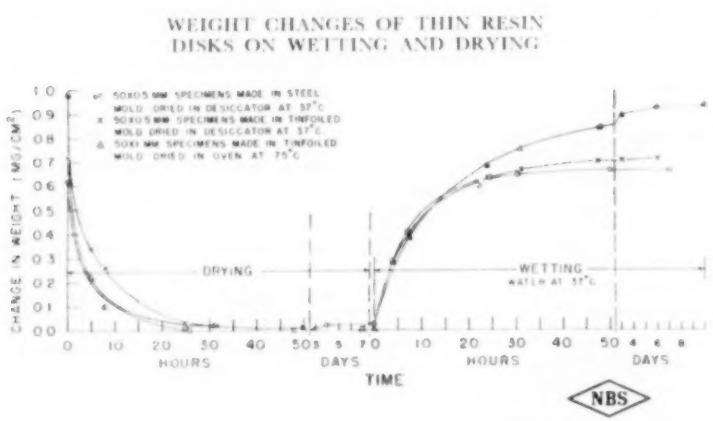

Fig. 1 • Loss and gain of water with time in thin disks of heat-cured resins. Specimens had been stored in water before start of test at zero time

specimens of wetting and drying. Before the test started, the specimens were stored in water. The 0.5 mm. thick specimens became saturated with water at 37°C. more rapidly than the 1.0 mm. thick specimens. At the end of 24 hours, the water sorption for the 0.5 mm. specimens was slightly less than for the 1 mm. specimens. At the end of 2 days, the 0.5 mm. specimens were saturated with water, while the 1 mm. specimens became saturated in 5 to 10 days.

The drying rates of the different specimens were similar. The time required to dry the 1 mm. thick specimens to constant weight over a dessicant (anhydrous calcium sulfate) at 37°C. (98.6° F.) was approximately 4 days. The drying rate of the 0.5 mm. thick specimens over the desiccant at 37°C. (98.6°F.) was practically the same as that for the 1 mm. specimens conditioned in air at 75°C. (167°F.). Each curve of Figure 1 is an average of at least four determinations.

V. *Transverse Test* (4.3.5) • Figure II shows the position of the specimen plate of resin in a flask (Buffalo No. 30 Ejector type) in detail because the thickness of the gypsum that surrounds the resin plate during processing affects the heat transfer to and from the plate and, therefore, may affect the properties of the resin. From this resin plate are machined the specimens used in the transverse test (Fig. IV). The necessity for a definite method of specimen preparation is illustrated by the data in Figure 2, which show the variation in values for transverse strength for three methods of cutting specimens.

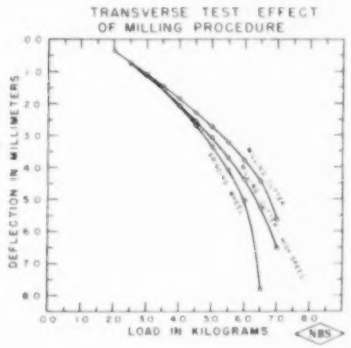

Fig. 2 • Effect of method of cutting specimens used in transverse test from plate (Fig. II) on strength and stiffness. Specimens conditioned in air at 37°C. (98.6°F.) and 32 per cent relative humidity and then tested in air

The medium in which the specimen is flexed in the transverse test is changed from air at 37°C. (98.6°F.) to water at this same temperature because in service a denture is stressed in saliva and not in air. This change in test procedure is readily accomplished by placing the specimen (Fig. IV) during the test in a water bath at 37° ± 1°C. (98.6° ± 1.8°F.). Loads are applied by pouring

Table 3 • Effect of test media on transverse tests of denture resins*

Specimens conditioned in water and tested in:	Deflection from 1,500 Gm. to						Breaking load		
	4,000 Gm.			6,000 Gm.					
	Min. mm.	Max. mm.	Avg. mm.	Min. mm.	Max. mm.	Avg. mm.	Min. Gm.	Max. Gm.	Avg. Gm.
Water	1.6	2.3	1.9	3.3†	5.5†	4.2†	5,400	8,000	6,400
Air	1.7	2.8	2.1	3.4	7.5	4.6	6,000	8,600	7,350

Data obtained on 36 different resins on List of Certified Dental Materials.
†Seven resins broke at loads lower than 6,000 Gm. Data are derived from the remaining 29 resins.

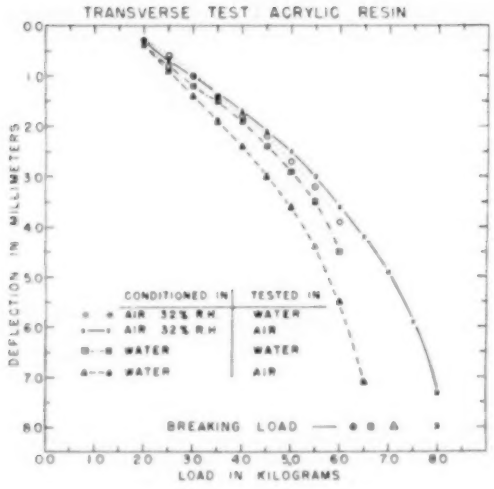

Fig. 3 • Average results in testing of one brand of resin conditioned for 3 days in water or in air and tested in water or in air

lead shot through a funnel mounted above the bucket.

Table 3 with data representing averages for 36 different resins shows the difference between testing in air and in water. The specimens tested in water have approximately 10 per cent lower breaking load and have less deflection than those tested in air. Therefore, the loads and deflections given in the current specification must be reduced if water is the medium in which the specimen is tested.

Figure 3 illustrates average results for one brand of resin conditioned for 3 days either in water or in air and tested in water or air. Fracture occurred at a lower stress and strain when the specimens were tested in water than when tested in air. This was true whether the conditioning treatment was wet or dry. Specimens conditioned and tested in air were stiffest and strongest. Specimens conditioned in air and stressed in water were the weakest. Specimens conditioned in water were not as stiff as those conditioned in air. The data seemingly indicate that water absorbed during storage of the specimens acts as a plasticizer and reduces the stiffness of the resin without changing greatly the transverse strength.

Both the effect of conditioning specimens used in the transverse test and the effect of the media in which the specimens are stressed show the importance of having the laboratory tests simulate closely actual service conditions. The specimens dried in air and tested in air were the strongest and stiffest because water was almost entirely absent. The strength of specimens conditioned in air and tested in water was the lowest probably because of the extremely rapid sorption of water into the dry and, at the same time, severely strained specimen. The stiffness of these specimens was not greatly reduced below that of the air-dried, tested-in-air specimens possibly because the abnormal sorption of water does not occur during the strain caused by the early loading. The water-condi-

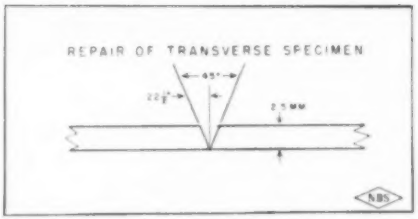

Fig. 4 • Ends of specimens (away from break) used in transverse test (Fig. IV) were notched as shown

tioned, tested-in-water specimens also had a low strength. The water-conditioned, tested-in-air specimens, which had the treatment prescribed in the current specification,[1] had high strength but low stiffness. A possible reason for this behavior is that the water-conditioned specimens have sufficient water present to reduce their stiffness. As these specimens were tested in air, no additional water could be sorbed during straining of the specimens; and consequently, they had a strength between that of the air-conditioned, tested-in-air specimens and water-conditioned, tested-in-water specimens.

VI. *Color Stability (4.3.6)* • The color stability test remains unchanged except that the thickness of the specimens is reduced from 1.0 to 0.5 mm. in order to use the same specimens as are used in the sorption and solubility tests. A drawing of the type of apparatus used in this test is shown in Figure V. The lamp is identical with that recommended by the American Society for Testing Materials.[6]

VII. *Repair* • No test for reparability was added in the revision. Several tests based on transverse strength and deflection were investigated. In one case specimens which had been fractured in the transverse test (4.3.5) were used. If the specimens did not fracture during testing, they were sawed in two through the center. The ends of the specimens away from the break or cut were beveled 22½ degrees and placed in contact with one another, making a notch of 45 degrees at the junction (Fig. 4). This notch was packed with resin dough, and the repair was made in the conventional dental manner. In another instance a section approximately 6 mm. in width was removed from the center of the specimen plate (Fig. II), and the repair was made. The transverse test specimens were then machined from the plate and tested in water as directed in 4.3.5.

In no case were the repairs as strong as the original resin (Table 4). When the V-notch type of repair was used, as is commonly done in practice, the value for strength varied widely and was on the average 40 per cent lower than the strength of the original specimens. Consistent strength values for the repaired specimens were obtained on specimens machined from a repaired specimen plate. These data are given in Table 4 under the column labeled "repaired by section method." This method, however, does not simulate actual conditions of use. There were no significant differences among the resins as far as reparability was concerned. For these reasons it was decided not to incorporate a test for reparability in the revised Specification even though several suggestions to include one were received.

6. A.S.T.M. Standard D 795-49.

Table 4 • Transverse strength of repaired denture resins

Normal breaking load of unrepaired resin	Repaired by V-notch method (Fig. 4)	Repaired by section method
Gm.	Gm.	Gm.
Clear 6,300 ± 200	3,800 ± 600	5,300 ± 200
Pink 6,300 ± 200	3,600 ± 500	5,300 ± 200

AMERICAN DENTAL ASSOCIATION SPECIFICATION NO. 12 FOR DENTURE BASE RESIN [ACRYLIC RESIN OR MIXTURES OF ACRYLIC AND OTHER RESINS] SECOND REVISION

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification is for denture base resin composed of any of the following types of resin: (1) polyesters of acrylic acid, (2) polyesters of substituted acrylic acids, (3) vinyl esters, (4) polystyrenes or (5) copolymers, or mixtures, of any of the foregoing resins.

1.2 Types and Classes. Denture base resin covered by this specification shall be of the following types, classes and colors as specified:

Type I. Heat-curing resins.
  Class 1. Powder and liquid.
    Color A. Pink
    Color B. Clear
  Class 2. Plastic cake 5 ± 3 mm. (0.20 ± 0.12 in.) thick.
    Color A. Pink
    Color B. Clear
  Class 3. Precured blank.
    Color A. Pink
    Color B. Clear
Type II. Self-curing resins.
  Class 1. Powder and liquid.
    Color A. Pink
    Color B. Clear

2. APPLICABLE SPECIFICATIONS

2.1 Specification. There are no other specifications applicable to this specification.

(Copies of American Dental Association specifications may be obtained free upon application to the American Dental Association Research Fellowship, National Bureau of Standards, Washington 25, D. C.)

3. REQUIREMENTS

3.1 Liquid. The liquid shall be water clear and free of deposits or sediment.

3.2 Powder. The powder, plastic cake and precured blank shall be free of extraneous material such as dirt and lint.

3.3 Uncured Resin, Classes 1 and 2.

3.3.1 Class 1 resin when used as directed by the instructions accompanying the package (3.4.9) shall be considered ready for packing when the plasticity is such that the resin separates cleanly from the walls of the glass mixing jar (4.3.1.1). This condition shall be attained in 20 minutes or less from the start of the mixing. Five minutes later the resin when subjected to the test described in 4.3.1.2 shall be capable of being intruded into at least two holes of the die (Fig. I) to a depth of not less than 0.5 mm. (0.02 in.).

3.3.2 Class 2 resin when treated according to the manufacturer's instructions shall be capable of being intruded into at least two holes of the die (Fig. I) to a depth of not less than 0.5 mm. (0.02 in.).

3.4 Cured Resin.

3.4.1 Working Qualities. The resin when processed according to instructions furnished by the manufacturer (3.4.9) shall yield a satisfactory denture.

3.4.1.1 Glossy Surface. The resin shall have a glossy surface when cured in a gypsum mold lined with tin foil.

3.4.1.2 Polish. The resin shall present a smooth surface having a high gloss when polished by the conventional dental methods.

3.4.2 Color. The depth of color of the cured resin shall be as specified by the purchaser. The color shall be uniformly distributed or mottled. Clear resin shall be crystal clear.

3.4.3 Translucency. The specimen plate (Fig. II) formed as described in 4.3.5 shall be translucent.

3.4.4 Porosity. The specimen plate

(Fig. II) cut as described in 4.3.5 shall not show bubbles or voids.

3.4.5 Sorption. The increase in weight of the resin shall not be more than 0.7 mg. per square centimeter of surface after immersion in water for 24 hours at 37° ± 1°C. (98.6° ± 1.8°F.) as described in 4.3.3.

3.4.6 Solubility. The loss in weight of the resin shall not be more than 0.04 mg. per square centimeter of surface when tested as directed in 4.3.4.

3.4.7 Transverse Deflection. The deflection of at least three of the five specimens prepared as outlined in 4.3.5 shall meet the following requirements when tested in water at 37° ± 1°C. (98.6° ± 1.8°F.):

DEFLECTION LIMITS OF SPECIMENS IN TRANSVERSE TEST OF DENTURE RESINS

Load	Deflection for loads* 1,500 Gm. (3.3 lb.) to		
	3,500 Gm. (7.7 lb.)	5,000 Gm. (11 lb.)	
	Maximum mm.	Minimum mm.	Maximum mm.
Type I	1.8 (0.071 in.)	2.0 (0.079 in.)	5.0 (0.197 in.)
Type II	2.5 (0.098 in.)	3.5 (0.139 in.)	6.5 (0.257 in.)

*Deflections shall be measured from an initial load of 1,500 Gm. (3.3 lb.) to the load indicated.

3.4.8 Color Stability. The resin shall not show more than a slight change in color when tested as described in 4.3.6.

3.4.9 Manufacturer's Instructions. Instructions for storing and processing shall accompany each package. The instructions for Type I, Classes 1 and 2 resins shall include as applicable: powder-liquid ratio, temperature of flask when the resin is packed, time to bring to recommended curing temperature, time to hold at curing temperature, method of cooling flask and time to release flask.

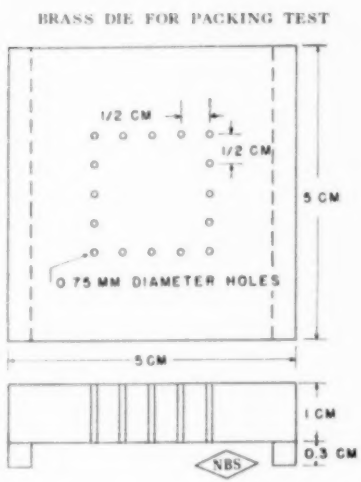

Fig. I • Brass die used in testing plasticity of uncured resin

The manufacturer's instructions shall conform to those specified in 4.3.2. In addition to the instructions given in 4.3.2,

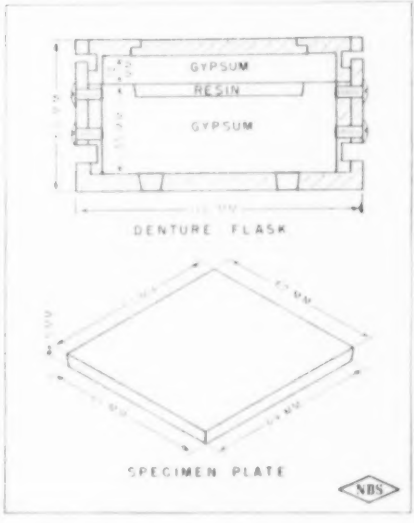

Fig. II • Position of specimen plate in flask

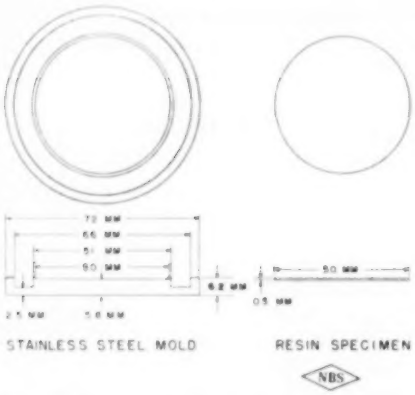

Fig. III • Stainless steel mold and specimen disk prepared for use in tests for sorption, solubility and color stability

the manufacturer may provide one alternate set of instructions. The manufacturer shall certify that the resin will meet the requirement of this specification when it is processed according to the alternate method as well as according to the prescribed methods. The instructions for Type I, Class 3 and Type II resins shall be those prescribed by the manufacturer. The manufacturer's instructions shall include also a method for using the resin as a repair material.

4. SAMPLING, INSPECTION, AND TESTING PROCEDURES

4.1 Sampling. Sufficient resin to make not less than ten dentures (10 units) shall be procured at retail by a member of the American Dental Association. This sample shall be forwarded in the original unopened package or packages to the American Dental Association Research Fellowship, National Bureau of Standards, Washington 25, D. C.

4.2 Inspection. Visual inspection shall be used in determining compliance with the requirements outlined in 3.1; 3.2; 3.4.1.1; 3.4.1.2; 3.4.2; 3.4.3; 3.4.4; 3.4.8; 3.4.9; 5.1; and 5.2.

4.3 Physical Tests.

4.3.1 Mixing and Packing Characteristics.

4.3.1.1 Mixing. Class 1 resins shall be mixed as directed by the instructions accompanying the package except that the mixing temperature shall be 23° ± 1°C. (73.4° ± 1.8°F.). Likewise Class 2 resins shall be brought to this temperature prior to testing. Class 1 resin shall be considered ready for packing when the plasticity is such that the resin separates cleanly from the walls of the glass mixing jar.

4.3.1.2 Packing Test. A 6 to 10 Gm. sample of Class 1 or 2 resin shall be placed on the perforated brass die (Fig. I) to a depth of approximately 5 mm. (0.2 in.). The die and specimen shall be transferred immediately to an air chamber in which all the equipment has been preheated to within ± 5°C. (± 9°F.) of the packing temperature specified by the manufacturer's instructions (3.4.9). A glass plate approximately 5 mm. (0.2 in.) thick and 50 mm. (2.0 in.) square and a 5,000 Gm. (11 pound) weight shall be placed on the specimen immediately. A sheet of cellophane shall be used as a separator between the glass plate and the specimen. The packing test for Class 1 resins shall be started 5 minutes after the proper plasticity has been reached (3.3.1). Ten minutes later the die and specimen shall be removed from the air chamber and the resin stripped from the die. The depth of intrusion shall be measured with a steel scale and magnifying glass or with a dial gauge.

4.3.2 Preparation of Specimens of Cured Resin for Sorption, Solubility, Transverse and Color Stability Tests. Specimens of Type I, Classes 1 and 2 resin shall be processed in accordance with the following schedule: Ten minutes after the proper plasticity as specified in 4.3.1.2 has been reached, the flasked specimen (Fig. II), held in a flask clamp without springs, shall be submerged in

water at 73° ± 1°C. (163.4° ± 1.8°F.) for 8 hours or 73° ± 1°C. (163.4° ± 1.8°F.) for 1½ hours and then immersed in boiling water for ½ hour. When the heating schedule has been completed, the flask in the clamp shall be cooled in air at 23° ± 10°C. (73° ± 18°F.) for 30 minutes and then immersed in water at 23° ± 10°C. (73° ± 18°F.) for 15 minutes. For Type I, Class 3 and Type II resins the manufacturer's instructions shall be followed.

4.3.3 Sorption. The water sorption test shall be made in duplicate on disks 50 ± 1 mm. (1.97 ± 0.04 in.) in diameter and 0.5 ± 0.1 mm. (0.02 ± 0.004 in.) thick (Fig. III). These specimens shall be made in a stainless steel die (Fig. III). The die shall be mounted with gypsum in the flask in the same relative position as the specimen plate in Figure II. The gypsum in the shallow half of the flask shall be poured against a glass plate to obtain a smooth plane surface. Trial packing shall be conducted with moist cellophane used as a separator. Before final closure of the flask a sheet of tin foil shall be substituted for the cellophane. All surfaces of the disk shall be smooth, and the top and bottom shall be flat. The disks shall be dried in a desiccator containing anhydrous calcium sulfate ($CaSO_4$) at 37° ± 2°C. (98.6° ± 3.6°F.) for 24 hours, removed to a similar desiccator at room temperature for 1 hour, then weighed with a precision of 0.2 mg. This cycle shall be repeated until constant weight is attained, that is, until the weight loss of each disk is not more than 0.5 mg. in any 24 hour period.

The disks shall then be immersed in distilled water at 37° ± 1°C. (98.6° ± 1.8°F.) for 24 hours, after which time the disks shall be removed from the water with tweezers, wiped for 30 seconds with a clean, dry hand towel, waved in

TRANSVERSE TESTING MACHINE

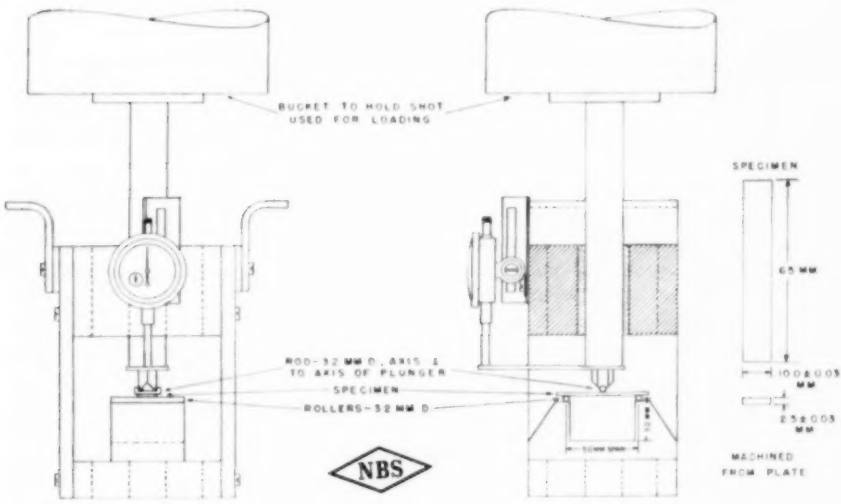

Fig. IV • Apparatus and specimen used in transverse test. Lower section of apparatus is submerged in water at 37°C. (98.6°F.) to cover specimen

the air for 15 seconds and weighed 1 minute after removal from the water.

The value for water sorption shall be calculated as follows for each disk:

$$\frac{\text{weight after immersion} - \text{conditioned weight (mg.)}}{\text{surface area (sq. cm.)}} = \text{sorption (mg. per sq. cm.)}$$

The average of the determined values for the two disks shall be recorded to the nearest 0.01 mg. per square centimeter. The final value (average of two determinations) shall be rounded to the nearest 0.1 mg. per square centimeter. When the final value falls midway between two numbers, the even number shall be recorded.

4.3.4 Solubility. After the final weighing (4.3.3), the disks shall be reconditioned to constant weight in the desiccator at 37° ± 2°C. (98.6° ± 3.6°F.) as was done in 4.3.3. The soluble matter lost during immersion shall be determined to the nearest 0.01 mg. per square centimeter as follows for each disk:

$$\frac{\text{conditioned weight (mg.) (4.3.3)} - \text{reconditioned weight (mg.) (4.3.4)}}{\text{surface area (sq. cm.)}} = \text{solubility (mg. per sq. cm.)}$$

The final value (average of two determinations) shall be rounded to the nearest 0.01 mg. per square centimeter. When the final value falls midway between two numbers, the even number shall be recorded.

4.3.5 Transverse Deflection Tests. A plate of resin shall be processed in a gypsum mold lined with tin foil (Fig. II). Specimens for the transverse test shall be machined from this plate to the dimensions shown in Figure IV.

The plate (Fig. II) shall be sawed lengthwise into five equal strips with a band saw operated at a speed of approximately 100 meters per minute (328 feet per minute). For Type II resins the plate shall be at least 2 days old prior to sawing. The strips may then be sanded slightly on the molded surfaces, if necessary, to remove imperfections. All subsequent milling operations shall be with a 25 mm. (1 in.) diameter flycutter, operating at a spindle speed of approximately 1,800 revolutions per minute and at a table feed of about 15 cm. per minute (6 in. per minute). Rough cuts shall be approximately 0.08 mm. (0.003 in.) deep, and finish cuts shall be 0.03 mm. (0.001 in.) deep. The strips shall be mounted side by side in a vise and the edges machined parallel in order to remove all band saw marks. The strips at this point shall be over-size in width. One or more strips shall be mounted in a vise and the faces milled to the required thickness [2.50 ± 0.03 mm. (0.0984 ± 0.0012 in.)]. All five strips shall then be clamped face to face in a vise and the edges milled to the required width [10.00 ± 0.03 mm. (0.3937 ± 0.0012 in.)].

The specimens shall be stored in distilled water at 37° ± 1°C. (98.6° ± 1.8°F.) for 2 days immediately before testing. The specimen shall be mounted in an appropriate instrument, such as is shown in Figure IV. An initial load, consisting of the free-moving parts of the apparatus (Fig. IV) plus sufficient lead shot to make a load of 1,500 Gm. (3.3 pounds), shall be placed on the specimen.

Each 500 Gm. increment of shot shall be added at a uniform rate during the last 30 seconds of each minute. The following schedule shall be used in applying the loads and in making the observations:

SCHEDULE OF LOADING AND READING

Time		Load	Dial reading*
min.	sec.	Gm.	mm.
0	00	1,500	
0	30	1,500	A
1	00	2,000	
1	30	2,000	
2	00	2,500	
2	30	2,500	
3	00	3,000	
3	30	3,000	
4	00	3,500	
4	30	3,500	B
5	00	4,000	
5	30	4,000	
6	00	4,500	
6	30	4,500	
7	00	5,000	
7	30	5,000	C

Deflection at 3,500 Gm. = B − A
Deflection at 5,000 Gm. = C − A

*Readings shall be made to the nearest 0.01 mm.

The differences between the deflections at the initial load and at specified loads shall be taken as the deflections of the specimen. The recorded deflections shall be reported to the nearest 0.1 mm. When the determined number falls midway between two numbers, the even number shall be recorded.

4.3.6 Color Stability. One of the disks used in 4.3.3 and 4.3.4 shall be exposed to the radiation of a lamp (Fig. V) with an S-1 bulb which has been in use not less than 50 nor more than 400 hours. The light source shall be a combination tungsten filament mercury-arc enclosed in Corex D or other glass which has a low transmission below 2,800 A. The lamp shall be rated at 400 watts. The specimen shall be carried on an aluminum disk which shall be centered under the S-1 bulb and which shall rest on a phonograph turntable, operated at 33 revolutions per minute. The specimen shall be held by screws approximately 5 mm. (0.2 in.) above the disk and 12.7 cm. (5 in.) from the center and shall be maintained between 60 and 65°C. (140 and 149°F.). The plane of the top surface of the specimen shall be 17.8 cm. (7 in.) from the bottom of the S-1 bulb. After exposure for 24 hours, the specimen, compared with an unexposed duplicate specimen, shall not show more than a slight change in color (perceptible with difficulty). The comparison shall be made by visual inspection in daylight.

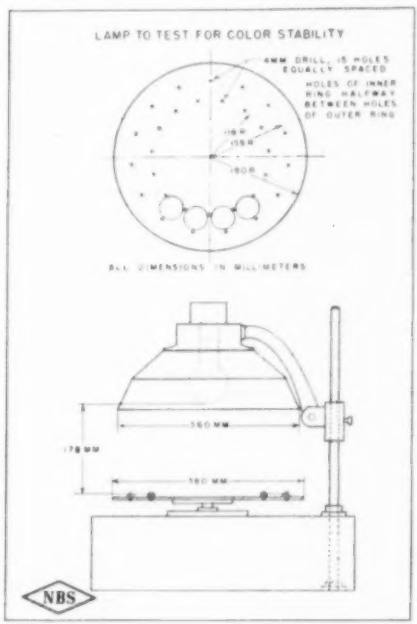
LAMP TO TEST FOR COLOR STABILITY
4MM DRILL, 15 HOLES EQUALLY SPACED
HOLES OF INNER RING HALFWAY BETWEEN HOLES OF OUTER RING
ALL DIMENSIONS IN MILLIMETERS
NBS

Fig. V • Lamp used in test for color stability of resins

5. PREPARATION FOR DELIVERY

5.1 Packaging. The material shall be supplied in properly capped glass containers or in aluminum envelopes.

5.2 Marking.

5.2.1 Lot Numbers. Each container of material shall be marked with a serial number or a combination of letters and numbers which shall refer to the manufacturer's records for that particular lot or batch.

5.2.2 Date of Manufacture. The date of manufacture (year and month) shall be given on the container either as a separate item or as a part of the lot number (5.2.1).

5.2.3 Net Weight and Volume. The minimum net weight in grams of powder and the minimum net volume in milliliters of liquid shall be given in legible type on the container. When the term "unit" is used as a designation, it shall represent not less than 21 grams of powder and a sufficient volume of liquid to combine with the powder.

The Convention's Contribution to Progress • Conventions portray their innate possibilities for progress. They evidence the slow, constant growth, development and fruition of the individual and, consequently, the profession. These meetings are giant crucibles in which the elements of our profession from all points of the compass are subject to the fire of close scrutiny. Ideas take shape, individuals grow, together they are the crystallized essence of progress. Nor is progress necessarily confined to developing new ideas and technics. They are but the products of an individual's efforts. Just as every crystalline substance has a characteristic structure, so does the individual. *"Conventions—What For?" St. Louis Dental Society Bulletin 23:92 September, 1952.*

COUNCIL OF THE NATIONAL BOARD OF DENTAL EXAMINERS

Nation-wide committees construct examinations

The construction of examinations to be used in a nation-wide program for the determination of qualifications in the art and science of dentistry is one of the major responsibilities of the Council of the National Board of Dental Examiners. The fact that students from 32 dental schools participated in the last examination session serves to emphasize the extent of the responsibility assumed in such a program. There are now 28 state licensure boards, as well as the United States Public Health Service and Puerto Rico, which accept the certificate awarded by the Council of the National Board of Dental Examiners, and there are several dental schools which recommend the examinations to all of their undergraduate students. In addition, there are six states which accept the certificates on occasion and are giving consideration to complete acceptance of the program.

The National Board examinations are divided into two parts. Part I, which includes comprehensive examinations in the basic sciences such as anatomy, bacteriology, physiology, general pathology, histology and embryology, and physiological chemistry, generally is taken at the end of the student's second year. Part II, which covers the fields of operative dentistry, materia medica and therapeutics, prosthetic dentistry, oral surgery and anesthesia, orthodontics, jurisprudence and ethics, oral pathology and roentgenology, usually is taken near the end of the student's fourth year of study. It is, of course, possible for practicing dentists to take either part of the examination at any time. It is apparent from the subjects listed above that the National Board examinations cover most of the areas included in the undergraduate curriculum. In order to construct valid and reliable examinations in so many areas, the results of which will be acceptable to all of the state dental examining boards, the Council has developed a program of constructing examinations which utilizes the learning and experience of a large group of persons.

There are 12 groups working on the construction of these examinations. Each group is made up of four or five outstanding dental examiners or dental educators. Members of these groups are selected from all parts of the country so that the test questions are truly representative of the subject matter being taught throughout the nation. The committee members, in their development of test batteries, construct a course outline in each of the subject areas with an indication of the relative importance or weight which each of the major subdivisions of such an outline should have. From this weighted outline it is possible to determine the number of items that should be included for each subdivision of the course. By collecting examination questions from all of the members of these groups, it is possible to assemble a large

reservoir of test items from which one can assemble the final examination form.

It is a great responsibility to compile and edit an examination which is to be taken by 1,000 or more students, so an effort is made to have each examination approved by several committee members. Whenever possible, the entire group working on the examination approves the final form before it is actually used.

The Council of the National Board of Dental Examiners appreciates the cooperation of its consultants and the many dental school members who have worked on these examinations. With such continued cooperation, the profession may look forward to a constantly improving battery of examinations.

There has been a sharp rise recently in the number participating in the examination sessions. A résumé of the number of participants in the examinations for the past two years shows the expanding activity of the National Board:

		Part I	*Part II*	*Total*
April	1951	301	232	533
December	1951	325	25	350
				883
April	1952	922	499	1,421
December	1952	1,074	83	1,157
				2,578

A test administration manual has been prepared so that the tests can be given as uniformly as possible in all of the testing centers, thus assuring each examinee an equal opportunity to do his very best. The test administrators are selected from the persons most concerned with the aim and objectives of the Council of the National Board of Dental Examiners. These persons are Council members, consultants to the Council, members of state dental examining boards, and members of dental school faculties.

The examinee is assigned whenever possible to the testing center of his choice. Three choices of examining centers are asked of each person. If he is a dental student, the examinee generally is assigned to the dental school in which he is a student. If the examinee is a practicing dentist, every opportunity is made to assign him to the center nearest his place of practice. For dentists in the armed services special assignments are made so that the military dentists may take the examination at their station, whether it be overseas or in the United States.

An examination schedule is sent individually to each applicant with his admission slip. An instruction sheet on how to mark the special answer sheet is supplied to each examinee at examination time. The importance of understanding the directions for each test is emphasized before the start of each examination.

The program of the Council of the National Board of Dental Examiners is one that requires the cooperation of examiners, dental school teachers, and practitioners. The future of the program is dependent on the construction of tests on a sound basis thus producing a program that wins the support of the examiners and the schools. The majority of the members of the state boards, the teachers and the students in dental schools are demonstrating their support of the program, and it is hoped that in the future all of the dental schools and state boards will make use of the National Board certificates.

COUNCIL ON DENTAL THERAPEUTICS

Council announces classification of additional products

The classification of products by the Council on Dental Therapeutics has been described in a previous report (*J.A.D.A.* 40:489, April, 1950). The Council's program now provides for classification of products in Group A, Group B, Group C and Group D. Products are reconsidered periodically, and decisions are subject to change at any time that a substantial amount of new evidence becomes available. The files of the Council contain information on many drugs and dental cosmetics, and inquiries are welcome.

GROUP A

Listing of products in Group A means that at the time of their consideration, the items conformed with the provisions for acceptance established by the Council on Dental Therapeutics and adopted by the Board of Trustees and the House of Delegates of the American Dental Association. Items in this group will be listed in *Accepted Dental Remedies* and may use the Seal of Acceptance, unless otherwise provided.

The following additional products are classified in Group A:

Eugenol (Precision Bur Company): A brand of eugenol, U.S.P. See *A.D.R.*, ed. 18, p. 53.

Parachlorophenol (R. F. Revson & Company): A brand of parachlorophenol, N.F. See *A.D.R.*, ed. 18, p. 52.

Tincture Cetylcide (Cetylite Industries, Inc.): An antibacterial solution for topical application stated to contain benzalkonium chloride, 0.065 per cent; cetyl dimethyl ethyl ammonium bromide, 0.065 per cent; alcohol, 50 per cent; acetone, 10 per cent; color and water. See *A.D.R.*, ed. 18, pages 56 and 87.

GROUP B

Listing of products in Group B means that there is insufficient evidence to justify their present acceptance, but there is reasonable evidence of their usefulness and safety. These products meet the other qualifications and standards established by the Council on Dental Therapeutics and the Division of Chemistry. It is the Council's opinion that Group B products may be promoted for special use and study.

GROUP C

Listing of products in Group C means that the evidence is so limited or inconclusive that the products cannot be accurately evaluated. It is the Council's opinion that Group C products require further study by qualified investigators.

GROUP D

Listing of products in Group D means that they are unacceptable because of their demonstrated inability to meet the standards outlined in the provisions for acceptance.

The following additional products are classified in Group D:

Insul-Base (Park-Woods, Manhasset, New York): (For detailed report, see p. 70.)

Kwikseal (Arrow Dental Products, Detroit): (For detailed report, see p. 71.)

COUNCIL ON DENTAL RESEARCH

COUNCIL ON DENTAL THERAPEUTICS

Report on Insul-Base and Kwikseal—ready mixed products intended for pulp protection

Several products have appeared which are intended to provide a therapeutic base for the protection of the dental pulp under restorations. These products are promoted as ready-to-use substitutes for the conventional zinc oxide-eugenol cements which are employed for that purpose. Because evaluation of these items involves consideration of their physical characteristics as well as their therapeutic value and safety, the Council on Dental Research and the Council on Dental Therapeutics have prepared the following report which is issued as a joint statement by the two agencies.

The purpose of a cavity-base material should be to provide a nonirritating insulating layer between the dentin and the restoration; that is, amalgam, gold, silicate cement or resin. The base should possess such physical properties that will permit the proper placement of the veneer material without damage through pressure on the pulp. It should, therefore, be sufficiently hard to resist dislodgment, distortion, or fracture during the manipulative procedures employed in placing the restoration.

The base material should not contain agents that adversely affect the tooth structures or the filling material proper. In the past, zinc oxide-eugenol preparations have been placed against the pulpal wall of the cavity, and a hard-setting cement has been used over the zinc oxide layer to provide substantial support for the veneer and, in the case of resin restorations, to prevent the passage of eugenol into the polymerizing resin.

Insul-Base (Park-Woods, Manhasset, N. Y.) • This product is described as an "instant-ready cavity lining pad," "semi-hard, will not spread nor yield under pressure. Excellent for pulp-capping and accidental exposures." The dentist is instructed to select a pad of proper size, place it over base of cavity and tamp it with a cotton pellet moistened with alcohol; then "plug your alloy, synthetic or plastic fillings" on it.

In a letter received from the firm, Insul-Base was stated to consist of a pad of unspecified composition, impregnated with the mixture listed below. The statement does not account for 4 per cent of the product.

"Eugenol	2%
Thymol	1%
Asbestos Fibers	2%
Zinc Oxide	23%
Calcium Hydroxide	23%
Waxes (chiefly beeswax and carnauba wax)	45%"

A preliminary examination of Insul-Base was made by the American Dental Association Research Fellowship at the National Bureau of Standards. The product consists of a thin fibrous cloth bearing some whitish mixture, presumably of the composition given by the manufacturer. It was found that Insul-Base interferes with the polymerization of the direct filling resins. The product does not become hard as does a zinc phosphate cement or even a zinc oxide-eugenol cement. Insul-Base does not resist the indentation of a standard Gill-

more needle (1 lb. in weight and having an end 0.0417 in. in diameter), and a perceptible circle is made on and retained by the surface of Insul-Base. Insul-Base is so flexible that one would hesitate in the case of an exposure or near exposure to "plug your alloy, synthetic or plastic fillings" on it.

The material requires too much force to adapt it to the cavity floor even if alcohol is used. The use of alcohol on an exposed pulp is not in keeping with current concepts in therapeutics.

The Councils question the availability for therapeutic effect of the calcium hydroxide and other inorganic constituents when they are incorporated into a wax base. It is questioned whether Insul-Base exerts any beneficial effect on the pulp beyond that which would be obtained from the use of a simple layer of wax. The firm was asked to furnish histological and clinical evidence for the safety and usefulness of the product, but there has been no response to this request.

Because the Council on Dental Research finds the product unsuitable as a cavity base material and because of the lack of demonstrated therapeutic usefulness and safety, the Council on Dental Therapeutics has voted to classify Insul-Base in Group D.

Kwikseal (Arrow Dental Products, Detroit, manufacturer; Interstate Dental Co., Inc., New York, sole distributor.) • Kwikseal has been promoted to the profession as a ready-mixed immediate temporary stopping, "non-irritating, always plastic, sets under saliva only . . . no mixing . . . no heating . . . no pressure."

It is supplied as a cellophane-wrapped stick of material which is plastic at room temperature.

According to a letter received from the firm, Kwikseal is guaranteed to stay plastic in storage but will set hard on contact with saliva in 8 to 15 minutes; "its density enables the dentist to provide a leakproof and tasteless seal over sedative medications applied in the cavity. Although no therapeutic claims are made for it, it can be said, on the basis of past experience, that Kwikseal has no harmful effect on the pulp tissue."

The quantitative composition is stated to be:

"Zinc Oxide	40.0%
Zinc Sulfate	4.0%
Calcium Sulfate	25.0%
Potassium Sulfate	2.5%
Calcium Phosphate	5.0%
Calcium Hydroxide	5.0%
Water Absorbing Aliphatic Base (A Mixture of Lanolin and Ointment of Wool Alcohols)	18.0%
Methylester of Oxybenzoic Acid	0.25%
Aromatica	0.25%
	100.00%"

The firm was asked to submit histological and clinical evidence of the usefulness and safety of this product. No evidence was offered other than the following statement: "Kwikseal has been in dentists' hands for over 25 years and is being used in numerous dental schools."

Kwikseal was examined by the American Dental Association Research Fellowship at the National Bureau of Standards. It was found that after four hours in the mouth, a brittle, friable crust approximately 1 mm. thick formed over the filling, the center of which was yet plastic. Even when left overnight in a water bath at 37°C. the material was not set throughout. It was so weak that a slight pressure with the fingers crumbled the specimen. In the opinion of the investigators, the material is not stiff enough to provide a reasonably solid support for the filling material, particularly when, under the operative technic now widely practiced, neither water nor saliva would

be permitted to come into contact with it.

The material is, therefore, not satisfactory as a cavity base material or temporary filling material in dentistry.

In view of the report from the American Dental Association Research Fellowship, and because of the lack of evidence for the safety and therapeutic usefulness of the product, the Council on Dental Therapeutics has voted to classify Kwik-seal in Group D.

BUREAU OF LIBRARY AND INDEXING SERVICE

The American Dental Association Film Library

The following films have been added to the American Dental Association Film Library and are now available to dental societies, study clubs and dental schools. Since the number of prints of each title is necessarily limited, it is suggested that program chairmen of dental societies and study clubs plan their programs far enough in advance to insure availability.

Many films are requested on an emergency basis as a substitute for a speaker who has disappointed the program chairman rather than on a regular basis to provide the main program or to supplement the speaker's remarks. The type of film used and the manner in which it is presented will affect the entire program favorably or unfavorably. Films, to be used effectively, should be previewed by the program committee so that they can formulate a plan of presentation and adapt the film to the interests of the particular group. Such procedure may include the preparation of an introduction to the film and a list of questions to be asked at its conclusion to stimulate discussion. Such utilization will not only add variety to the program but it may also help increase attendance and provide program material for future meetings. According to the American Dental Association Film Library booking records, films still are being used by only a small percentage of dental societies and study clubs. Now that many technical films are available through the Association Film Library it is hoped that this figure will be increased. A more detailed report on the topic, "Utilization of Visual Materials," is now being prepared, and announcement of its availability will be made in a subsequent issue of THE JOURNAL.

FILM REVIEWS

Endodontia and Immediate Apicurettage • 16 mm., color, silent, 1,100 feet, showing time 35 minutes. Produced in 1950 and revised in 1952 by David Green, D.D.S. Photography by Alvin Taylor. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago 11, Ill.

This film shows in detail the steps involved in endodontic treatment and an apicurettage performed on an upper left cuspid with a long history of pathology and on an upper right lateral incisor with a cyst extending from the central incisor to cuspid and into the base of the maxillary sinus. Dr. Green's technic, which reduces armamentarium to a minimum, features the elimination of drugs in contact

with the tissues and the vertico-oblique incision. The course of disinfection includes frequent irrigation of the canal with sterile hot water to remove all debris, steaming the canal and desiccating the walls before gutta-percha is inserted. Chloroform is used as a solvent. Principles of asepsis are used similar to those used in all major surgical operations. This film is so well planned that there is no break in continuity during any of the procedures. Since the film is silent, the titles and legends make it self-explanatory. The use of roentgenograms and colored diagrams adds to its instructional value. Since the photography and lighting are good the viewer can see all the intraoral activity clearly. This film is suitable for senior and postgraduate dental students, general practitioners and oral surgeons. It is also suitable for dental society or study club programs.

Pulp Canal Therapy • 16 mm., color, sound, 900 feet, showing time 25 minutes. Produced in 1942 by the Medical Guild Ltd. Prepared, directed, and narrated by Harry Albert, D.D.S., 57 W. 57 St., New York, N. Y. Procurable on loan ($2.50) from the A.D.A. Film Library, 222 E. Superior St., Chicago 11, Ill., and on loan or purchase from Dr. Albert.

This film clearly demonstrates the procedure followed in the preservation of teeth with involved pulps. The author's technic, which enables the dentist to treat involved teeth with the minimum armamentarium, stresses the elimination of drugs; the use of hot water; the thorough drying of the canal; the plunger method of filling the canal; and the surgical procedures. This film is very well organized. It combines photographs of patients with preoperative and postoperative roentgenograms and animation. The photography is good and although the film was produced ten years ago the technics are not dated. All the intraoral activity is clearly visible. This film is suitable for postgraduate dental students, general practitioners and oral surgeons. Dental societies and study clubs also will find it good program material.

Examining the Oral Cavity • 16 mm., color, silent, 1,600 feet, showing time 45 minutes. Produced in 1950 by the University of Minnesota School of Dentistry. Demonstrated by William J. Simon, D.D.S., M.S.D. Photography by James H. Rothenberger. Procurable on loan ($2.50) from the A.D.A. Film Library, 222 E. Superior Street, Chicago 11, Ill., and on loan or purchase from the University of Minnesota School of Dentistry, Minneapolis.

This film presents a series of patients with oral lesions resulting from various causes, such as osteomyelitis, automobile accidents, rheumatoid arthritis, cellulitis, hematoma, fissures in tongue and carcinoma of palate. Each case is followed by a diagnosis and an outline of treatment procedures. The film is well organized. Since this is a silent film the legends make it self-explanatory. The photography is good. The many close-ups increase its instructional value. It is suitable for dental students and can be used in a course on oral pathology to supplement R. Howard Brodsky's book, *Atlas of Oral and Facial Lesions*. A set of 80 slides which accompany this book can be obtained on request. Dental societies and study clubs may include this film in their programs.

Practical Procedures in Oral Surgery • 16 mm., color, silent, 3 reels: reel 1, 411 feet; reel 2, 423 feet; reel 3, 392 feet, showing time 11 minutes, 13 minutes, and 9½ minutes respectively. Produced in 1942 and revised in 1952 by Samuel Granof, D.D.S., dental surgeon at Mt. Sinai Hospital, Milwaukee, Wisconsin. Photography by Frank Murphy. Procurable on loan ($2.50) from the A.D.A. Film Library, 222 E. Superior St., Chicago 11, Ill., and on loan or purchase from Dr. Granof, 212 N. Wisconsin Ave., Milwaukee 3, Wis.

The purpose of this film is to demonstrate practical procedures in oral surgery. It is divided into three reels, each treating a different aspect: reel 1, anesthesia; reel 2, removal of impacted cuspids and cysts, and reel 3, immediate dentures and an alveolectomy. The film opens with an outline showing the steps to be followed, indicating the kind of anesthetic agent and armamentarium used. It concludes with postoperative instructions to the patient. The use of roentgenograms and diagrams increases its instructional value. Although the film is silent, the titles and legends make it self-explanatory. This film can be used for dental students in its entirety as an introduction or as a review of certain aspects of oral surgery, or the reels can be used separately in dental courses on the topic covered by the films. It is also suitable for dental society or study club programs.

BUREAU OF LIBRARY AND INDEXING SERVICE

Additions to the library

The books and package libraries listed here have been added recently to the library collection. Requests for this material, available on loan to all members of the Association, should be addressed to the Bureau of Library and Indexing Service. There is no charge for borrowing books, but a rental fee of fifty cents should accompany requests for each package library. Most of these books may be purchased also from the library.

BOOKS

AMERICAN DENTAL ASSOCIATION. American dental directory. Chicago, The Association, 1952. 1,050 p. $7.50.

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PACKAGE LIBRARIES

Alloys, base metal
Asymmetry of face
Aureomycin
Cephalometric diagnosis
Chlorophyll
Curare
Endotracheal intubation
Erythema multiforme (Stevens-Johnson disease)
Heart disease in relation to oral surgery
Oral surgery—drugs used in
Orthodontic force
Orthodontic treatment—Norwegian system
Otolaryngology and dentistry
Periodontal diseases—antibiotics in treatment
Periodontal tissue changes in tooth movement
Tyrothricin, gramicidin and other antibiotics

COUNCIL ON DENTAL HEALTH

Conference on prepayment plans for dental services

In continuing its study of prepayment plans for dental services, the Council on Dental Health met with representatives of Blue Shield Medical Care Plans at the Central Office of the American Dental Association in Chicago. The conference was held October 27 in conjunction with a regular meeting of the Council.

Blue Shield representatives present were Charles H. Crownhart of Madison, executive secretary of the Wisconsin State Medical Society and chief executive of the Blue Shield Plan for Wisconsin; Don T. Diller of Harrisburg, executive director of Blue Shield for the state of Pennsylvania; Carleton Fox of Detroit, a practicing oral surgeon and a member of the governing board for Blue Shield in Michigan; Dr. Warren W. Furey of Chicago, radiologist, president of the Blue Shield Plan in the Chicago area, member of the Blue Shield Commission, past president of the Chicago Medical Society and a delegate from Illinois to the American Medical Association House of Delegates, and Frank E. Smith of Chicago, director of Blue Shield Medical Care Plans.

The chief accomplishment of the session was a clarification of the method of approach for the establishment of prepayment dental care plans. First, it will be necessary to determine what dental services are insurable risks; secondly, if the state does not have enabling legislation to permit operation of such a dental care plan, it will be necessary to have existing laws amended or new laws enacted. Then, with the knowledge of what is to be insured and the authority to insure it, pilot studies on a limited, not a broad-coverage, basis should be initiated.

There are two types of prepayment plans: one based on insurance principles, such as Blue Cross, the other on per capita fees and contract dentistry, such as the Health Insurance Plan of Greater New York, Inc. (H.I.P.) in New York. The latter type is not generally acceptable because it does not meet the standards established by the medical profession for sound prepayment plans. Moreover, some state laws prohibit H.I.P. plans. H.I.P. is not approved by the New York State Medical Association nor by the American Medical Association.

INSURABLE RISKS

The initial concept of prepayment health plans was protection from catastrophic illness, and the majority of dental services will not fall into this category. Because dentistry has many more elective services than do other areas of health, actuarial predictions in the dental field are more difficult to make. The areas of dental care are examination and diagnosis, prevention, operative treatment, periodontics, prosthodontics, surgery and orthodontics.

ENABLING LEGISLATION

Dentists obtained amendment to the existing enabling act in Pennsylvania which was one of the first states to give some dental coverage in a Blue Shield plan. This coverage was initiated by the dentists in 1949 and is restricted to oral surgery for hospitalized patients.

In July, 1951, a "Master Steel" contract was signed between the United States Steel and Carnegie Pension Fund and the Blue Shield plan in Pennsylvania. The agreement's inclusion of a provision for a uniform contract in all states led to difficulties where state laws differed. In some states, for example, a lack of enabling legislation and of provisions in the Blue Shield contract prevents direct payment to dentists.

BENEFITS

There are certain calculated risks which must be assumed when developing a prepayment program. The utilization of services under an insurance plan is probably always higher than it is when no plan is involved, and the premium rates should be established with this probability in mind. In Pennsylvania, the dental service coverage in the Blue Shield plan is limited to oral surgery. Dentists, however, object to the "in-hospital-only" restriction, saying it forces them into the position of hospitalizing patients who could be operated on in the office. Alveolectomies performed in hospitals under the Pennsylvania plan increased significantly when this service was covered by Blue Shield: one 40-bed hospital had 19 admissions for alveolectomies in one month, 22 in another month.

The public undoubtedly wants inclusion of dental services in Blue Shield, but it is questionable whether it will pay the increased rates that would be necessary to obtain them. A case in point is the "Master Steel" contract: Blue Shield had to reduce benefits in order to bring them in line with the amount the company wanted to pay; there was no question of increasing payments.

In Pennsylvania, two "benefit" schedules are maintained—one for the $2,500 income group, one for the $5,000 income group; in Wisconsin, a sliding fee schedule is used, rated according to income. The bracket in which the individual's income falls is the determining factor.

PILOT STUDIES

The wisest course for dentistry to pursue in entering the prepayment field would be through the establishment of several of the pilot type of programs. One good way would be to develop an experimental dental prepayment plan limited to children, especially in an area where most children can be provided services on a maintenance basis. The existence of a large backlog of unmet dental care needs has been one of the chief stumbling blocks in the development of a prepayment plan.

CONCLUSION

Blue Shield probably would have a more favorable attitude toward inclusion of dental benefits if the dental profession established its own prepayment organizations and had Blue Shield manage the administrative operation. This pattern has been established in the medical profession, physicians incorporating their own plans, known as Blue Shield, and purchasing such administrative requirements as public relations, clerical and sales services from Blue Cross. Such a plan would assure dentists of retaining control over their own professional services.

COUNCIL ON DENTAL RESEARCH

List of certified dental materials

Since the publication of the most recently revised List of Certified Dental Materials (revised to September 1, 1952) in the November, 1952, issue of THE JOURNAL, the following materials have been added.

CERTIFIED AMALGAM ALLOYS
(A.D.A. SPECIFICATION NO. 1)

Alloy	*Manufacturer or Distributor*
Silverloy Filings, Fine Cut no. 20 for Proportioner	Crescent Dental Mfg. Co.
Abner Fine Cut	Abner Alloys Co.

CERTIFIED IMPRESSION COMPOUNDS
(A.D.A. SPECIFICATION NO. 3)

Compound	*Type*	*Manufacturer or Distributor*
Kerr Black	1	Kerr Manufacturing Co.

The manufacturers of the following materials have advised us that they no longer produce these brands. Therefore, we are requesting that they be removed from the List of Certified Dental Materials of the American Dental Association.

CERTIFIED AMALGAM ALLOYS
(A.D.A. SPECIFICATION NO. 1)

Alloy	*Manufacturer or Distributor*
Diamond Edge	Young-Baker & Co.
Lustraloy Cut T	Pfingst & Co.
Uniform	Philadelphia Dental Supply Co.
S-R	Lee S. Smith & Son Mfg. Co.

Cases and Comments

THE FULL UPPER IMPLANT DENTURE

By Fred Weitz, D.D.S., and A. J. Shapiro, D.D.S., Chicago*

A woman, aged 48, came to the office with the complaint that she could not tolerate dentures, either upper or lower. Gagging and extreme salivation made it impossible for her to wear them; as a consequence she was unable to eat solid foods. She had had an edentulous upper arch for almost four years. During that time several dentures had been made.

Examination disclosed that the upper ridge was almost flat and in addition there were high muscle attachments. There were six anterior teeth in the mandible and apparently good ridges. Roentgenograms showed complete alveolar resorption. Irritation of the mucosa was evident on the ridge opposing the teeth. An abnormal vertical closure also was present. The six lower anterior teeth were healthy and were suitable for use as clasp abutments. Judging from these observations, there was no apparent reason why appliances, properly designed, could not be constructed.

The patient had made an earnest effort to adjust to dentures and she was favorable to the suggestion of an upper implant. Her physical condition was satisfactory and therefore she was considered a good surgical risk.

Impressions and bite registration were taken and the models were mounted on an articulator. Special trays were prepared and a direct impression of the bone structure was taken in advance for the transference of the vertical and centric dimensions. Hospital care and medication were provided before surgery and postoperatively.

The procedure required two surgical operations. The first stage consisted of incising the mucoperiosteum and taking a direct impression of the bone on which the substructure would rest. Between the first and second operations, the sutured region healed. In the interim the appliance was made. The second stage consisted of re-opening the same region and seating the substructure.

Recovery after both operations was rapid. There was a small amount of edema postoperatively as well as moderate pain, a slight elevation in temperature but no complications. Sutures in both instances were removed after the sixth day. Strict oral hygiene was stressed.

Granulation took place and cicatrix formed about four weeks after the second operation. New impressions of the healed ridges were taken with the superstructure *in situ*. Vertical and centric relationships were re-established and a lower partial denture provided. In the arrangement of the teeth, the patient's preference was considered as far as was mechanically possible. The implant denture began to function immediately after insertion. The correct bite was restored, eating was facilitated, irritation was eliminated and gagging and salivation did not occur. Improved appearance contributed greatly to the satisfaction of the patient.

Periodic roentgenographic and oral examinations were made postoperatively. At each examination the maintenance of the established vertical opening and the functional balance as well as any added stress on any of the implanted abutments were checked.

4000 Lawrence Avenue

*Head of oral surgery department, Edgewater Hospital.

HEREDITARY DENTINOGENESIS IMPERFECTA

By Samuel J. Potts, D.D.S., Wichita Falls, Texas

The patient was a 20 year old white man who had enlisted in the Air Corps. The dental survey examination revealed considerable attrition and nearly complete loss of vertical dimension when his teeth were in centric occlusion. Examination also revealed a full complement of teeth which were worn away almost to the gingival crest. Two carious teeth were present with no apparent pulpal involvement. The enamel of the molars easily could be picked from the dentin with an explorer (Fig. 1). Calculus was not observed. The pulp test elicited an essentially normal response. Blood analysis and audiograms were essentially negative.

The patient's history revealed no environmental cause for the disease. The condition had been present in his mother, grandmother and great grandmother and was present in one of his two sisters, but was absent in two brothers. There was a higher incidence in the siblings of the grandparents.

Roentgenographic examination revealed shortened roots with rounded apexes, a generally thickened periodontal membrane, fairly dense alveolar bone and periodontal involvement of the two lower first molars. The pulp canals of all the bicuspids and the lower central incisors were obliterated. The other teeth had canals which were somewhat constricted. Roentgenograms of the skeletal system revealed no abnormalities, and this, coupled with the absence of blue eyes in all four generations, tends to rule out osteogenesis imperfecta which has been described as exhibiting defects of the teeth similar to those described by Rushton,[1] Becks[2] and others.

Histologically the teeth revealed a picture similar to that which has been described frequently. Decalcified sections showed hypoplastic dentin with numerous interglobular spaces, many of which contained blood pigments and highly irregular dentinal tubules (Fig. 2). No pulp tissue could be identified but numerous small canals were seen winding through the dentin. The cementum was essentially normal. The enamel as seen in ground sections was essentially normal in structure.

Treatment consisted of the extraction of all the teeth with frenotomy and alveolectomy.

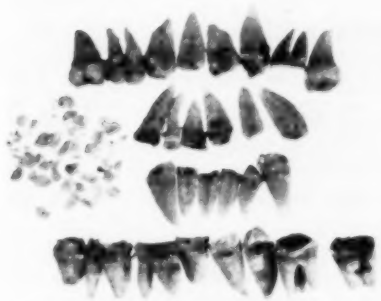

Fig. 1 • Extracted teeth. Note how enamel falls away

To date the patient has received three sets of dentures with a 1.57 mm. increase in the vertical opening in each instance. The result appears highly satisfactory, both esthetically and functionally. There is a possibility that had treatment been delayed, some disturbance might have resulted in the patient's facial and auditory structures. The patient remained on duty throughout the treatment and is now performing general duty with a remarkable improvement in attitude.

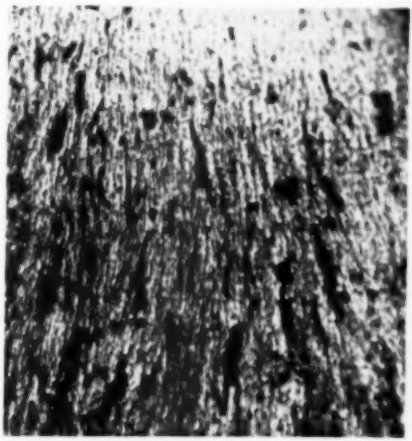

Fig. 2 • Ground section showing highly irregular dentinal tubules. ×75

The case as presented is considered to be compatible with previously recorded cases of hereditary dentinogenesis imperfecta.

Major, DC, USAF, Sheppard Air Force Base.

1. Rushton, M. A. The structure of the teeth in a late case of osteogenesis imperfecta. J. Path. & Bact. 48:591 (May) 1939.

2. Becks, Hermann. Histologic study of tooth structure in osteogenesis imperfecta. D. Cosmos 73:437 (May) 1931.

TOOTH IN TONSIL

By G. A. Moulden, Liverpool, England

Foreign bodies embedded in the tonsil are sufficiently rare to warrant recording. I have just seen a 16 year old girl who was referred to me because of the presence of something hard in the tonsil. This had caused no discomfort, but the patient had noticed something unusual about the right tonsil when she was looking at her throat in the mirror. On examination, a greyish mass was seen at the site of the opening of the crypta magna of the right tonsil. This was hard and brittle to the touch. The mass was removed and found to be a rough concretion about ⅜ by ½ by ⅛ inch (1 by 1.3 by 1 cm.), in which was embedded a deciduous incisor tooth. Neither the patient nor her mother could remember any accident in which a deciduous tooth could have been lost.

British Medical Journal, April 5, 1952, p. 766

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THE Journal OF THE AMERICAN DENTAL ASSOCIATION

Editorials

The Surgeon General of the Navy speaks out on the health professions

The attack launched last month by Rear Admiral Lamont Pugh, Surgeon General of the Navy, against his fellows in the health professions may go down in history as one of the top slurs against two professions which have contributed immeasurably to the splendid health care given the military patient and of which the Admiral has been so frequently and properly boastful.

Speaking before the Association of Military Surgeons of the United States on November 17 the Surgeon General took members of the medical and dental professions to task for what he calls a reluctance to serve in the military forces—a reluctance which he said was based on "avarice" and a preference for the easier, quicker and bigger money of private practice.

"Since when," asks the Admiral, "has the doctor of medicine and dentistry become such a pantywaist as to require that a bald responsibility others accept with good grace must be decked out with certain frills before he will buy it. And when I use the phrase 'will buy it' I quote verbatim both the prima donna doctor and his agents. During my sojourn at the combatant front in Korea this past summer I failed to detect evidence of any special effort being made on the part of anyone to make the service more attractive to the soldiers and marines who were fighting, bleeding and dying in the heat and dust on a barren Korean hillside."

If the Admiral wrote his speech himself, he did so in ignorance of the real patriotism which has motivated the dental profession in its support of the military services in

peace and war. If it were written for him, he must have read it without understanding its implications. The military record of dentists needs no apology. Many remember the meager dental standards of the Army and the Navy during World War I. It was through the efforts of dentists and not those of the military administrators that standards were raised and more dental officers were commissioned to care for the needs of the servicemen. Thousands remember the irritating inequalities inflicted on members of the dental corps who served during World War II not for glory or braid or money but only from a sense of duty to their profession and to their nation.

The dental profession takes pride in the fact that approximately 22,000 dentists, or about one third of the total number of practicing dentists in the United States, served in the Armed Forces during World War II—a record unexcelled, as Admiral Pugh should know, by any other vocational group in the country. The proportionate number of dentists and physicians who volunteered their services during both World Wars was far greater than that of volunteers from other walks of life.

Early in the present Korean conflict, the military requested a compulsory draft act for members of the health professions. Congress complied by passing Public Law 779. Since then most dentists and physicians have lived in a constant state of uncertainty, unable to plan for the future, because the admirals and others of high military rank have been incapable of developing an orderly, efficient system of recruiting of health personnel so necessary to the health of the military forces and the welfare of the nation.

In commenting on the Surgeon General's blast, Otto W. Brandhorst,[1] president of the Association, said: "I hope, as he reflects upon his remarks and the additional difficulties that will, no doubt, be engendered by them, he will see the wisdom of retracting them for his own greatness and the good of the military service of this nation."

Dr. Brandhorst is to be commended for his deft handling of a difficult situation. He might have added, for the Admiral's information, that dentists of today and those of tomorrow, like those of the past, will assume their full military obligations in time of national need. And while the performance of such obligations is difficult under the best of conditions, it is made doubly so by the wild and irresponsible broadsides of an incautious executive officer.

1. See page 91 of this issue.

Only one month left to complete plans for National Children's Dental Health Day

The fifth National Children's Dental Health Day is to be observed this year on February 2. The objective of the occasion is to improve dental health in the United States and eventually throughout the world. This improvement can be brought about best by a twofold program which will educate parents and teachers to the necessity of providing children with early and regular dental service and stimulate dentists to increase their practice of pedodontics.

Each year since 1948 the Association, in cooperation with its constituent and component societies, has engaged in a public dental educational campaign built

about Children's Dental Health Day to bring the dental health problems of children and youth to the attention of the public and the dental profession. On this annual occasion renewed emphasis is placed on the necessity of conducting a program of preventive dentistry in the community throughout the year.

The annual National Children's Dental Health Day program differs from most public health and welfare projects in two major respects: as regards management and money. The management and most of the effort are contributed by members of the profession. The program is sponsored by the Association, and the activities are carried out under the direction of the local dental societies. As for money, there is no public appeal for funds. There is no seal, stamp, dime or dollar drive to finance the plan's activities. The program is conducted solely as an educational project without a call for contributions.

Annual National Children's Dental Health Day is so recent an undertaking that its results cannot be evaluated thoroughly. Nevertheless, even a casual observer must admit that it has already accomplished much good. More and more schools are inaugurating dental health services. More and more preschool children are benefiting from early dental care. More and more communities are fluoridating their drinking water and more dentists are providing more children with dental service including topical applications of sodium fluoride.

Interest in preventing serious dental disorders of children is renewed annually by observance of Children's Dental Health Day. Such interest in youth is bound to create concern regarding the dental defects of adults as well, with the result that inestimable value should accrue to both individual and community health.

The Association and most of the constituent societies are making special preparations for this year's Children's Dental Health Day programs. Posters, newspaper articles, radio scripts and other educational material have been made available by the Association. Special school programs and community events designed to further dental health are being developed and promoted by the local dental societies.

Members of the dental profession are urged to participate in this year's program. Efforts toward the prevention and correction of dental disorders offer dentists a unique opportunity for community service. General recognition of that opportunity by dentists will assure the success of Children's Dental Health Day on February 2.

Washington News Letter

PRESIDENT'S COMMISSION REPORTS

Based upon a one-year study, the final report of the President's Commission on Health Needs of the Nation firmly advocates increasing the number of dentists, greater financial support of dental research and extension of communal water fluoridation. The report was submitted to President Truman on December 18.

While proposing expansion of Federal participation in national health, the signed document refrains from recommending any sort of compulsory insurance system. Three of the Commission's 15 members, however, registered dissatisfaction with the majority's scheme to encourage universal coverage in voluntary prepayment plans through joint action of federal and state governments. The only practical solution, they suggested, is adoption of national health insurance.

The dissenters were Walter P. Reuther, president of CIO; Albert J. Hayes, president of International Association of Machinists, and Elizabeth S. Magee, general secretary of National Consumers League.

Evidence collected by the Commission indicates need of materially increasing the number of practicing dentists. The most feasible method of achieving that end, says the report, is federal financial aid to the professional schools. Establishment of government scholarships also is recommended.

The report states that with some 2,900 dentists being graduated annually in this country at the present time, a net gain of 1,500 (over deaths, retirements, etc.) is inadequate to meet needs.

"To solve the problem of increasing the supply of dentists, a number of approaches are required," the report says. "These include: (1) Expanding the schools which have adequate faculties and facilities to maximum enrollments; (2) developing new schools, preferably on a regional, interstate basis; (3) removing economic and geographic barriers which stand in the way of the enrollment of many qualified candidates; (4) increased use of dental hygienists and other auxiliary dental workers."

Financial stress is sorely handicapping the teaching functions of dental colleges, says the report, which points to low salaries, inroads made by the Armed Forces and inadequacy of research facilities as tending to drag down the standards of dental education.

"Since it is obvious that training the needed number of dentists would overextend our present educational resources, we must consider immediate ways of stretching our present supply of dentists," the Commission states. "The more effective utilization of dental hygienists and of dental assistants can greatly increase the amount of service a dentist can give, and offers the greatest hope for making dental care quickly available to more people.

"The expected supply of 85,000 dentists in 1960 could probably make good use of 150,000 dental assistants and 20,000 dental hygienists. Only about 6,000 dental hygienists and 55,000 dental assistants are working today, but since the training period for these workers is relatively short, the output could be stepped up appreciably. An active recruitment program could tap a considerable manpower potential, and efforts in this direction should pay great dividends in meeting needs for dental services."

The report urges increased private and governmental support for medical and dental research; training of more health personnel, including dentists, in special

technics of rehabilitation; and recognition that "dental care be considered an essential component of comprehensive health service, to be made available for children immediately and for the entire population as rapidly as possible."

Ernest G. Sloman, dean of College of Physicians and Surgeons, San Francisco, served as dental member of the President's Commission from its establishment in December 1951 until his death last summer. As his successor, President Truman appointed Lester W. Burket, dean of the University of Pennsylvania School of Dentistry.

VA MANAGEMENT SURVEY

The new President and the new Congress undoubtedly will give serious consideration to the health commission's report, in connection with pending proposals for reorganization of the federal government's own medical establishment as well as with Washington's future participation in fulfillment of civilian health needs. Due also to be taken under advisement is the recently published report on operations of Veterans Administration, based upon a 16-month study that was conducted by the Chicago management firm of Booz, Allen and Hamilton.

One of the recommendations, with reference to the Department of Medicine and Surgery, was that the dental department be reduced in administrative status to a level on a par with nursing, radiology, pharmacy and other auxiliary services. This proposal was rejected by Administrator Carl R. Gray, Jr., but it cannot be foretold what changes may be made during the Eisenhower Administration.

Both the B-A-H and President's Commission reports emphasize the need for Congress to clarify lines of responsibility for health care of veterans, particularly in the area of non-service-connected diagnoses. In this regard, the Chicago firm's report says in part:

"The magnitude of the dental service and the extent to which it is being used for both service-connected and non-service-connected cases also raises questions concerning present practice with respect to the intent of the law.

"With repeat applications approaching 40 per cent of total applications for this service, a review of the basic policy which calls for lifetime care of the 'service-connected' tooth and which, through custom, may extend that care to a full set of 'service-connected dentures,' is in order."

PRODUCTION EXPANSION

Dental instruments, equipment and supplies are included among items needed for military and civil defense stocks which are the subject of an "increase your production" campaign. In mid-December, the Defense Production Administration announced that it has established a 10 million dollar goal for increasing capital investments in plants making medical and dental materiel, to be completed by January 1, 1955. Already approved or pending are $8,400,000 in tax amortization applications, thus leaving $1,600,000 still open to reach the required expansion.

Association Affairs

RELIEF FUND DRIVE HITS THREE FIFTHS OF GOAL

A total of $62,038.36 had been contributed to the Association's Relief Fund Campaign as of December 15, it was announced by the Council on Relief.

As the 1952-53 goal is $100,000, the contributions totaled slightly more than 62 per cent of the campaign quota. Five constituent societies had topped their goals. They included Alabama, Alaska, Montana, North Dakota and Oklahoma.

Contributions by constituent societies as of December 15 were as follows:

	1952-1953 Quotas	Contributions to Dec. 15	Pct.
Air Force	$ 560.00	$ 205.00	36.6
Alabama	770.00	849.89	110.3
Alaska	50.00	107.00	214.0
Arizona	270.00	83.00	30.7
Arkansas	530.00	396.15	74.7
Army	540.00	289.00	53.5
California	3,620.00	2,495.50	68.9
California, So.	4,460.00	2,616.40	58.6
Colorado	960.00	257.50	26.8
Connecticut	1,950.00	1,337.00	68.5
Delaware	150.00	104.00	69.3
Dist. of Col.	860.00	635.00	73.8
Florida	1,220.00	1,062.00	87.0
Georgia	1,070.00	614.50	57.8
Hawaii	370.00	164.00	44.3
Idaho	260.00	143.00	55.0
Illinois	7,570.00	5,281.00	69.7
Indiana	2,240.00	1,700.00	75.9
Iowa	1,880.00	1,070.00	56.9
Kansas	990.00	702.46	71.0
Kentucky	1,080.00	435.50	40.3
Louisiana	990.00	495.50	50.0
Maine	450.00	253.00	56.2
Maryland	1,080.00	730.00	67.5
Massachusetts	3,810.00	2,410.67	63.2
Michigan	3,990.00	2,677.65	67.1
Minnesota	2,970.00	1,808.50	60.8
Mississippi	520.00	347.10	66.7
Missouri	2,590.00	1,979.00	76.4
Montana	380.00	398.50	104.8
Navy	790.00	289.50	36.6
Nebraska	1,080.00	1,015.50	94.0
Nevada	100.00	87.00	87.0
New Hampshire	290.00	219.00	75.5
New Jersey	4,140.00	2,852.00	68.8
New Mexico	220.00	168.50	76.6
New York	15,220.00	7,222.00	47.4
North Carolina	1,240.00	573.25	46.2
North Dakota	350.00	433.55	123.8
Ohio	4,970.00	3,284.80	66.0
Oklahoma	900.00	916.00	101.7
Oregon	1,180.00	906.50	76.8
Panama C. Z.	30.00	5.00	16.7
Pennsylvania	6,970.00	3,926.44	56.3
P. H. Service	270.00	103.00	38.1
Puerto Rico	190.00	98.00	51.5
Rhode Island	570.00	255.00	44.7
South Carolina	400.00	208.00	52.0
South Dakota	340.00	169.00	49.7
Tennessee	1,150.00	428.50	37.2
Texas	3,050.00	1,409.00	46.2
Utah	480.00	282.00	58.7
Vermont	190.00	110.00	57.9
Vet. Admin.	960.00	251.00	26.1
Virginia	1,140.00	713.50	62.5
Washington	1,780.00	1,300.50	73.0
West Virginia	720.00	532.50	74.0
Wisconsin	2,930.00	1,791.50	61.1
Wyoming	160.00	150.50	94.0
Seniors		675.50	
Miscellaneous		14.00	
Totals	$100,000.00	$62,038.36	62.0

ADMISSIONS, SPECIALTIES TO BE TOPICS AT CONFERENCE

"What Admissions Requirements Should Be Used in Dental Schools?" and "What Constitutes a Specialty in Dentistry?" will be the subjects of the two panel discussions which will comprise the ninth Congress on Dental Education and Licensure, to be held February 7 in the Conrad Hilton Hotel, Chicago.

The Congress is sponsored by the Council on Dental Education and is designed for dental educators and examiners.

The morning session of the Congress will be devoted to a panel presentation and audience discussion of admission requirements. John Buhler, dean of Emory University Dental School, will be the moderator of this session, which will consider problems such as the relative importance of the two-year or three-year predental course; the value of personal interviews and letters of recommendation in the selection of dental students, and the relative importance of the predental transcript and the aptitude test report.

The afternoon session, to be moderated by Allan G. Brodie, dean of the University of Illinois dental school, will discuss "What Constitutes a Specialty in Dentistry?" Panel and audience participants will consider the definition of a specialty, the area of its operations, the determination of requirements for admission to a specialty examination, the possibility of periodic re-examinations and other related problems.

The Congress held last year was attended by about 200 persons; attendance this year is expected to exceed that number.

SPECIAL COMMITTEE SUBMITS DEFINITION OF ORAL SURGERY

At the first meeting of the Special Committee on Problems in the Field of Oral Surgery, held November 29-30 in the Central Office, definitions of the specialty of oral surgery and of its scope were approved for submission to the Board of Trustees.

The definitions, which were composed by the subcommittee on definition and scope, will be considered by the Association's Board of Trustees at its February meeting.

Oral surgery in dental education and in hospital dental service was also discussed by the Special Committee. Members in attendance included: Otto W. Brandhorst of St. Louis; Leslie M. FitzGerald of Dubuque, Iowa; James R. Cameron of Philadelphia; Sanford M. Moose of San Francisco; William N. Hodgkin of Warrenton, Va.; Bert L. Hooper of Lincoln, Neb.; Frank Hower of Louisville, Ky.; Philip M. Northrop of Ann Arbor, Mich., and F. A. Pierson of Lincoln, Neb.

In addition to staff members, four special consultants also attended the meeting. They were Frederick A. Henny of Detroit; W. T. Ewing of Akron, Ohio; Henry B. Clark, Jr., of Minneapolis, and John S. Voyles of St. Louis.

FILM LIBRARY ANNOUNCES PURCHASE OF FILMSTRIPS

Three more filmstrips are available for rental at a $1.00 fee from the Association's film library. All were produced in 1950 by the National Film Board of Canada for the dental health division of the Department of National Health and Welfare. They include:

Teenage Teeth (37 frames, color, with script, 11 minutes): tells how high school students may improve their appearance, social activities and general attitudes through proper oral hygiene. Suitable for senior high school students, college freshmen and adults. It may be purchased for $5.00 from Stanley Bowmar Company, 513 West 166 Street, New York 32.

Ten Little People and Their Teeth (33 frames, color, with script, 8 minutes): stresses a few simple concepts, such as proper diet, toothbrushing and visits to the dentist. Excellent for the preschool and lower primary grade children; the text is simple and much audience participation is involved. This, too, is available for $5.00 at Stanley Bowmar Company.

A Toothsome Tale (36 frames, color, no script required, explanatory texts on film, 10 minutes): shows the causes of tooth decay and of periodontal diseases and teaches good oral hygiene and proper diet. This humorous cartoon is suitable for teenagers and adults. It may be purchased for $5.50 from Midwest Visual Equipment Company, 3518 West Devon Avenue, Chicago 45.

TWO STAFF MEMBERS CHOSEN COUNCIL SECRETARIES

Two staff members of the Central Office have been appointed Council secretaries, according to an announcement by Harold Hillenbrand, Association secretary.

Gerard J. Casey, assistant secretary of the Council on Dental Education since October 1950, has been appointed secretary of the Council on Hospital Dental Service and the Council of the National Board of Dental Examiners.

G. J. Casey

Dr. Casey was graduated from the Chicago College of Dental Surgery, Loyola University, in 1937. Before service in World War II he spent five years in private practice. After release from the Army he joined Loyola's dental faculty, serving successively during 1946-50 as instructor, assistant professor and associate professor in dentistry for children.

B. J. Conway

Bernard J. Conway, assistant secretary of the Council on Legislation since December 1951, has been appointed secretary of the Council on Federal Dental Service and the Council on Dental Trade and Laboratory Relations. Mr. Conway has been on the staff of the Council on Legislation since he became a legislative assistant in 1949, the year in which he received his law degree from Loyola University and was admitted to the Bar.

The new appointments were made in accordance with administrative changes voted by the Board of Trustees and the House of Delegates during the 1952 annual session of the Association.

EQUALIZATION PAY NEEDED, COUNCIL CHAIRMAN STATES

The $100 monthly equalization pay for dental officers on active duty is necessary for the continued recruitment of career officers and for the financial survival of conscripted dentists, asserted Rudolph H. Friedrich, chairman of the Council on Federal Dental Services, in a statement to the Department of Defense Incentive Pay Commission.

The Commission, which has been considering the advisability of continuing equalization pay for physicians and dentists, requested the comments of the Association on December 1. Dr. Friedrich reiterated the position previously taken by the Association before Congressional committees that such pay was necessary "if dental officers were to be placed upon a comparable basis with other line and staff officers in terms of real income throughout their careers."

Dr. Friedrich pointed out that the average dental student spends three years more in acquiring his education than does the average college graduate; that he incurs an additional expenditure of $13,500 to $14,000 during that time; that he is unable to begin his career and earn a salary during that period and thus loses an income which amounts to $12,078 for newly-commissioned line officers during that period.

"We find that the dental student would enter the service as an officer more than $25,000 in arrears in terms of potential life-time disposable funds," Dr. Friedrich stated. He added that if the dental student had invested the $13,500 and had drawn a salary during three extra years of employment, his investment income would total more than the $100 monthly additional pay.

Without the special pay, he stated, a career dental officer would earn less than the average civilian dentist of his age and experience; recruitment for the several Dental Corps would be more difficult than it is now.

Regarding conscript officers, Dr. Friedrich pointed out that they are usually "individuals who had entered private practice and assumed a variety of obligations based on the expectation that they would continue in private practice and that their incomes would advance commensurately with normal achievement in their field." He stated that the $100 pay should be maintained to enable these men "to meet fixed obligations and to return to private practice unencumbered by debts."

Summarizing the need for continued equalization pay, Dr. Friedrich stated:

> The dentists of this country yield to no group in patriotism. . . . As a profession they will see to it that the dental health needs of the Armed Forces are cared for. But, when peace comes, it cannot be guaranteed that they will voluntarily render that service as members of the regular defense establishment, unless such service offers to them a career comparable in all ways with civilian practice.

PATHOLOGY SLIDES REPAIRED, READY FOR CIRCULATION

Study sets of Kodachrome slides are again available for loan at the Association's Registry of Oral Pathology, Washington, D. C. The sets, which had been withdrawn from circulation for repair, may be obtained on a loan basis at no charge by addressing Col. Joseph L. Bernier, director, Armed Forces Institute of Pathology, Washington 25, D. C.

The sets are arranged in five categories: benign and malignant tumors, mouth diseases, gingival and periodontal lesions, odontogenic tumors and cysts and oral manifestations of systemic diseases. Each set is composed of 100 Kodachrome slides.

ACCEPTED DENTAL REMEDIES, 1953 EDITION, ISSUED

Almost 700 dental products are listed and evaluated in the 1953 edition of *Accepted Dental Remedies,* which is now available for purchase. The section on prescription writing has been rewritten to conform with the new Durham-Humphrey amendment to the Food, Drug and Cosmetic Act. Other revisions include a bibliography on therapeutic agents, an evaluation of hand detergents containing hexachlorophene and a discussion of the role of dentifrices and mouth washes in dental hygiene.

The new edition of the book, published by the Council on Dental Therapeutics of the American Dental Association, may be purchased for $2.00 from the Association's Order Department, 222 East Superior Street, Chicago 11.

COUNCIL ON DENTAL HEALTH ISSUES TWO NEW PAMPHLETS

Two new pamphlets have been issued by the Council on Dental Health to assist dental societies, community organizations and other groups which are studying fluoridation.

The first booklet, *Fluoridation Facts,* lists erroneous assertions made by opponents of fluoridation and replies to these assertions with amply documented statements. A subject index and an extensive list of references are included.

The second booklet, *How to Obtain*

Fluoridation for Your Community, tells how a citizens' committee is formed, suggests program activities, lists steps in obtaining community acceptance and summarizes the legal technicalities to be met in obtaining fluoridation.

Copies of these booklets may be obtained free of charge by writing to the Council on Dental Health, American Dental Association, 222 East Superior Street, Chicago 11.

ASSOCIATION PRESIDENT ASKS REALISTIC RECRUITMENT PLAN

Realistic planning and the formulation of "definite and contractual" provisions can solve the problem of the military need for dental officers, stated Otto W. Brandhorst, president of the American Dental Association, in a speech delivered November 19 before the Association of Military Surgeons. Speaking two days after Rear Adm. Lamont Pugh had criticized civilian physicians and dentists for not volunteering for military duty, Dr. Brandhorst said, in part:

> Granted a short supply at the moment, only a cooperative effort will make services available to civilians and service personnel as well. The same cooperation and tolerance are needed in carrying out the provisions of Public Law 779. Some of the difficulties we are experiencing now seem obvious developments. Our thinking and planning have not been too good. Our "means to an end" approach did not consider sufficiently all the interlacing difficulties. With these experiences behind us, it behooves us to be more realistic in our planning.
>
> I regret very much that Admiral Pugh has seen fit to criticize the professions as he did in his paper Monday morning. I hope, as he reflects upon his remarks and the additional difficulties that will, no doubt, be engendered by them, he will see the wisdom of retracting

The group shown above met when Otto W. Brandhorst, president of the American Dental Association, and James P. Hollers, dentist member of the Armed Forces Medical Policy Council, toured Walter Reed Army Medical Center November 20. Standing (l. to r.) are Lt. Col. George W. Burnett, chief of research department, Army Medical Service Graduate School; Col. John S. Oertel, assistant director of the School's dental division; Col. Lynn C. Dirksen, commanding officer of the Center's central dental laboratory; Col. Arthur L. Irons, chief of the Walter Reed Hospital component's dental service, and Lieut. Myers R. Kurtz, administrative assistant of the School's dental division. Seated (l. to r.) are: Brig. Gen. Oscar P. Snyder, director of dental activities at the Center; Dr. Brandhorst; Dr. Hollers, and Col. William S. Stone, commandant of the Center and School.

them for his own greatness and the good of the military services of this nation. I resent the implications of his remarks and I speak for the dental profession in rejecting them as unwarranted and not productive of good will and cooperation, so necessary in the solution of the problems which we face.

The problem of need of professional services in the military, to me, is not an unsurmountable one. It is primarily a matter of better understanding and confidence, and I should like to add, making these opportunities more attractive. However, when I speak of their being more attractive, I am not encircling the word with a dollar sign. I mean attractive from the standpoint of an opportunity to serve, under agreeable conditions; on a cooperative basis; under plans and provisions that are definite and contractual.

In my travels as president-elect and president of the American Dental Association, I have, whenever opportunity presented, addressed the dental students (all classes). On every occasion I have urged the senior student to give serious thought to entering military services following graduation, as the most logical time for his tour of duty. Once established in practice, new problems and responsibilities enter the picture, and no dentist will like being uprooted from his practice, although he will submit to it in the emergency.

If we are realistic, we will recognize that the 3,000 dentists graduating annually from the dental schools are the logical source of supply. Over a period of several years, the pressing problem of today will not exist, provided we convince them that their tour of service will be a pleasant experience, a pleasant duty, a cooperative and associate effort with experienced men in the service, and that they can plan their future on the basis of contractual arrangements entered into and not changed by new directives except in the emergency. If they experience these satisfactions while in the services, their good will and pleasant urging will, in a very short time, create a situation when selection for the services will become competitive.

MEMBERS URGED TO PAY ASSOCIATION DUES PROMPTLY

The March 1953 issue of THE JOURNAL will be the last issue sent to Association members whose 1953 dues are not paid by March 31, it was recently announced. The cut-off date for subscriptions and insurance coverage was determined by the House of Delegates at the 1952 annual session.

Dental Societies

ATTENDANCE OF 15,473 LISTED AT NEW YORK MEETING

More than 3,000 dentists attended the color television clinics which were presented on the opening day of the Greater New York Dental Meeting, it has been reported by Arthur E. Corby of New York, general chairman. Ten television receivers transmitted a program of two morning clinics and four afternoon clinics to capacity audiences, Dr. Corby said.

A total of 15,473 attended the December 8-12 meeting, which was the twenty-eighth annual seminar sponsored by the First and Second District Dental Societies of the State of New York.

In an address to a general session of the meeting, Otto W. Brandhorst, president of the American Dental Association, stressed the need for increased financial support of dental education.

"Today it is fully realized that professional education is not self-supporting," he said. "Ways and means must be found for the channeling of funds to the schools if these institutions are to continue to maintain the present high standards of dental education and to provide the dental manpower so essential to the health and welfare of our nation."

Dr. Brandhorst also urged that New York City comply with the recommendation of its health department that fluoridation be adopted in the near future.

CRITICIZES FLAMBOYANT CLAIMS FOR CHLOROPHYLL DENTIFRICES

In a symposium on ammoniated and chlorophyll dentifrices, presented during the meeting, Thomas J. Hill of Cleveland criticized the claims made for chlorophyll and ammoniated dentifrices by flamboyant advertisements. Dr. Hill, chairman of the American Dental Association's Council on Dental Therapeutics, stressed that results of scientific tests do not substantiate the advertising copy and declared that no conclusive evidence exists that chlorophyll or ammoniated dentifrices help to fight tooth decay.

The symposium on dentifrices also featured papers by Robert L. Glass of Tufts College Dental School and John W. Hein of the University of Rochester Department of Dentistry and Dental Research.

A symposium on periodontics featured Joseph Schure of Brooklyn, moderator; Paul E. Boyle of the University of Pennsylvania School of Dentistry and Irving Glickman of Tufts College Dental School.

In addition the program included 42 registered clinics, a general session on full denture technic, 10 topic discussions, 51 table clinics, a motion picture program and a display of scientific and commercial exhibits.

NINE CLINICIANS TO PRESENT DALLAS MID-WINTER PROGRAM

Among the clinicians scheduled to present programs at the Dallas Mid-Winter Clinic, January 25-28, are Ernest R. Granger of Mt. Vernon, N. Y.; Ted A. Bodine of Akron, Ohio; Walter T. McFall of Asheville, N. C.; Fred A. Henny of Detroit; Haywood Norton of Berkeley, Calif.; Robert Gottsegen of New York; Harry Sicher of Chicago; Rex Ingraham of Los Angeles and Henry Tanner of Los Angeles.

The Mid-Winter Clinic, sponsored by the Dallas County Dental Society, will open January 25 at the Hotel Adolphus with registration and sightseeing. The remaining three days will be composed of full-day and half-day presentations by the guest clinicians.

On the evening of January 26, table clinics will be presented by 41 dentists and five teams from the University of Texas Dental Branch and Baylor University College of Dentistry. W. C. McCaskill, Jr., is general chairman of the Clinic.

CHICAGO MIDWINTER MEETING TO BE HELD FEBRUARY 8-11

The Midwinter Meeting of the Chicago Dental Society, to be held February 8-11 at the Conrad Hilton Hotel, will feature symposiums on water fluoridation and on the treatment of cleft palate. The meeting will open Sunday, February 8, with registration and the opening of 245 exhibits. The scientific program will include the presentation of 41 essays, 137 limited attendance clinics and 73 table clinics. More than 12,000 are expected to attend.

Kenneth McFarland, noted educator and lecturer, will address the first general session on the evening of Monday, February 9. His address will be entitled, "Fathoming the Fifties."

For the first time since World War II a Ladies' Luncheon and Fashion Show will be presented in conjunction with the meeting; it will be held at Marshall Field and Company. The major social event of the meeting will be a dinner dance and floor show on Wednesday evening.

Requests for information and hotel accommodations may be addressed to the Chicago Dental Society, 30 North Michigan Avenue, Chicago 2.

Public Health

PRESIDENT'S COMMISSION REPORTS ON NATION'S HEALTH

The President's Commission on the Health Needs of the Nation, which reported its findings on December 18, has recommended a program under which the government would help to expand professional schools and to develop new ones, enlarge voluntary prepayment medical insurance and award grants-in-aid for personal health services in cooperative federal-state programs.

The first volume of the Commission's report, which contains recommendations as summaries, was sent to President Truman in mid-December; it will be followed by four volumes of testimony and statistics gathered during the Commission's 11-month study.

Recommendations regarding dentistry include the following:

1. That schools of dentistry be modernized and expanded and that new professional schools be developed in regions which need them.

2. That federal funds be used to aid indigent dental students, as well as the schools.

3. That "less highly trained personnel" be utilized for nonprofessional tasks in health work, and that more dental hygienists and assistants be recruited to help extend the work of the limited number of dentists.

4. That the federal government grant greater support to dental research.

5. That the fluoridation of public water supplies be extended.

The Commission also recommended that the "principle of prepaid medical insurance be accepted as the most feasible method of financing the costs of medical care." Although a minority group of three members suggested the institution of national health insurance, the majority rejected this action.

Under the Commission's suggested program, a cooperative federal-state program would be established to assist in the financing of personal health services. A single state health authority would be set up in each participating state, to develop and distribute personal health services for all persons, using public or private agencies or resources. Federal grants-in-aid would be made from general tax revenues to the states for making available personal health services to public assistance recipients, to the general population or to victims of such diseases as tuberculosis and mental disease. Each state's program would be administered locally or regionally.

In its review of the health personnel situation, the Commission's report points to future shortages of physicians, dentists and nurses. It recommends the expansion of professional schools now in operation and the establishment of new schools through federal financial aid. The report also asks for federal grants for local health departments.

The federal share of the cost of the recommended program would be about $1,016,000,000, the Commission states. Grants-in-aid for personal health services would require three fourths of that total, and education, one tenth.

FLUORIDATION FOR 1,180,000 INAUGURATED IN BALTIMORE

In Baltimore, the largest fluoridation program in the United States was inaugurated November 26. H. B. McCauley, dental director of the Baltimore City Health Department, estimates that 1,180,000 persons in the city and the three surrounding counties will receive the fluoridated water. The program was inaugurated after a two-year period of preparation and a series of attempts to prevent the action.

Richmond, Va., and San Diego, Calif., also began their fluoridation programs during November. On December 10, the *News Letter* of the Council on Dental Health of the American Dental Association reported that 10 million persons in the nation were drinking fluoridated water.

PUBLIC HEALTH DENTIST SOUGHT BY NEW YORK STATE

The New York State Department of Health announces a nationwide examination for associate dentist (research) with a salary of $6,801-8,231.

This dentist, under general supervision of the director of the bureau of dental health, will direct a field program of dental epidemiological studies and dental research projects. His qualifications must include eligibility for a license to practice dentistry in New York State; two years in general dental practice; also one year of experience in dental epidemiological or research projects, or one academic year of approved graduate training in public health.

The examination will be given March 14, 1953, and an appointment to fill the vacancy will be made from the list in June.

Additional information may be obtained from the Department of Civil Service, 39 Columbia Street, Albany, N. Y. Applications must be received by February 6.

CITY OF FLUORIDATION FOE PLANS TO FLUORIDATE

Fluoridation has been reapproved in Faribault, Minn., home of the anti-fluoridation pamphleteer, W. D. Herrstrom. The City Council had tabled its previous approval at the request of anti-fluoride forces; but on December 10, after listening to proponents as well as opponents, the Council voted unanimously to reapprove the plan. W. D. Herrstrom's *Americanism Bulletin*, published in Faribault and widely circulated, has opposed water fluoridation.

STATE HEALTH OFFICERS RENEW FLUORIDATION DRIVE

The Association of State and Territorial Health Officers restated its approval of fluoridation at its meeting in Washington, D. C., December 8-11. The recommendation stated:

That the State and Territorial Health Officers Association, in view of the overwhelming evidence in favor of water fluoridation, re-emphasize that the full benefits of this public health measure should be brought to all communities as rapidly as possible, and that Association members aid communities in developing fluoridation programs by providing effective information, dental and engineering assistance.

In an address to the conference entitled "Report on the Nation's Health Programs," Leonard A. Scheele, Surgeon General of the USPHS, advised "public health statesmanship" in advancing fluoridation. He said, in part:

In the promotion of dental public health, the fluoridation of public water supplies needs to be skilfully interpreted to the people of our communities. Although more than 500 towns are now benefiting from fluoridation, the progress in applying this preventive measure has been impeded in some communities by mis-information. There have been some court action, referenda, and opposition by groups and individuals. . . . Public health statesmanship here consists in convincing the skeptics that our epidemiologic and laboratory studies are valid and that the benefits of fluoridation are not to be discarded lightly in the face of uninformed opposition.

At the request of the Council on Dental Health of the American Dental Association, the Association of State and Territorial Health Officers adopted principles to be observed in the provision of dental care for the recipients of public welfare.

The principles stress that such a dental care program should provide preventive services, dental health instruction and rehabilitative services, as well as emergency care. Administration by competent professional personnel and consultation with professional advisory committees are also advised.

Dental Education

NEW DEAN NAMED AT COLLEGE OF PHYSICIANS AND SURGEONS

E. Frank Inskipp of San Francisco has been appointed dean of the College of Physicians and Surgeons, succeeding Ernest G. Sloman, who died in April 1952. Charles A. Scrivener has been appointed associate dean.

A native of Bromley, Kent, England, Dr. Inskipp received his dental degree from the College of Physicians and Surgeons in 1931 and conducted a private practice for 20 years. In 1951 he became a professor and the registrar of the College, having previously served as an instructor of dental histology and an assistant professor of operative dentistry.

E. F. Inskipp

C. A. Scrivener

Dr. Inskipp is secretary of the College's alumni organization, a regent of the American College of Dentists, member and former president of the American Association of Dental Editors and the San Francisco Dental Society. He is also a member of the American Dental Association, American Association of Endodontists, A.A.A.S., Fédération Dentaire Internationale, Tau Kappa Omega, Omicron Kappa Upsilon and Xi Psi Phi. He is coauthor of a textbook on operative dentistry and a contributor to scientific journals.

Dr. Scrivener, a native of Missouri, received his dental degree from Kansas City-Western Dental College in 1930. He has been an assistant professor of operative dentistry at the College of Physicians and Surgeons since 1950.

DENTAL SCHOOLS ANNOUNCE NEW POSTGRADUATE COURSES

Illinois • "The Practical Approach to Periodontal Problems" will be the subject of this year's one-day course in periodontics, annually presented by the University of Illinois College of Dentistry immediately after the Midwinter Meeting of the Chicago Dental Society.

The course will be presented February 12 by W. G. McIntosh of Toronto, Balint Orban of Colorado Springs, Colo., and Lewis Fox of South Norwalk, Conn. Morning and afternoon sessions will feature lectures; the evening session will include a round table discussion by three lecturers.

Applications for the course may be obtained from the postgraduate extension division, University of Illinois College of Dentistry, 808 South Wood Street, Chicago 12.

Pennsylvania • A five-day course in crown and bridge, including internal precision attachment, will be presented February 23-28 by Charles B. Sceia at the University of Pennsylvania School of Dentistry.

The course is designed for general practitioners and those with limited experience in mouth rehabilitation. Demonstrations will include planning and design of the restorations, preparation of the abutment teeth, impression methods and use of materials, laboratory technic in detail and the cementation of the final restoration. Enrollment will be limited to 14.

Application may be made to Postgraduate Courses, School of Dentistry, University of Pennsylvania, 4001 Spruce Street, Philadelphia 4.

Southern California • The postgraduate courses to be offered at the dental school of the University of Southern California during the spring include:

Cast inlays and single tooth restorations, to be presented on Wednesday afternoons (8 sessions, 48 hours), February 18-April 15; impression technic (full and partial dentures), to be presented on Thursday and Friday afternoons (8 sessions) February 5-March 27; partial dentures I, to be presented on Thursday afternoons (6 sessions, 30 hours), March 5-April 9; diamond instruments and carbide burs in the preparation of cavities, to be presented on Sunday and Monday (no definite date) during May; esthetics and phonetics in denture prosthesis, to be presented Wednesday afternoons (no definite dates) in May.

Further information may be obtained by writing to the director of the division of postgraduate instruction, University of Southern California School of Dentistry, 925 West 34th Street, Los Angeles 7.

Tufts • An evening course in minor oral surgery will be presented each Wednesday evening for eight weeks, January 21-March 25, it has been announced by the Tufts College Dental School.

Information may be obtained by writing to the director of postgraduate studies, Tufts Dental School, 136 Harrison Avenue, Boston.

DENTAL LECTURE INCLUDED IN EMORY DEDICATION SERIES

John E. Buhler, dean of the School of Dentistry, Emory University, spoke on "Tooth Decay and What Modern Dentistry Can Do About It," December 7 at Emory University's new Woodruff Memorial Building. The lecture was one of a series presented in observance of the opening of the new center for medical research.

J. BEN ROBINSON TO RETIRE IN APRIL

J. Ben Robinson, dean of the Baltimore College of Dental Surgery, University of Maryland, will retire in April 1953, it was announced recently. Dr. Robinson has been dean of the school since 1924.

J. Ben Robinson

Well known as a dental educator and dental historian, Dr. Robinson was president of the American Dental Association, 1942-43, and served as a member of the Council on Dental Education during 1938-51. He was born in Clarksburg, W. Va., in 1883, was graduated from Marshall College in 1908 and taught in the West Virginia public schools before receiving his dental degree from the University of Maryland Dental School in 1914. Five years later he was appointed to a professorship and in 1924 he became dean.

In addition to the presidency of the American Dental Association, Dr. Robinson has held the presidency of the American Association of Dental Schools, 1932-33; the American College of Dentists, 1934-35, and the Maryland State Dental Association, 1921-22. He is a past supreme grand master of Psi Omega and has been awarded the Alpha Omega Achievement Medal, 1941; the Fones Award, 1942, and the Callahan Award, 1944.

This picture, taken in the Cha Lee reservoir, Korea, last September, shows Lieut. Samuel W. Johnston, DC, USA, at work in his open air office. Lieutenant Johnston, a graduate of the University of Maryland dental school, is stationed with an engineer combat battalion.

National Defense

FEBRUARY INDUCTION CALL TO TAP 286 DENTISTS

The Department of Defense has asked the Selective Service System to induct 286 dentists during February. The Army has requested 241 of these and the Air Force, 45. The Navy will continue to recall its Priority II-type Reserves.

The February inductees will be Priority III registrants and any Priority I and II dentists who have been reclassified after earlier deferments.

TWO DENTAL OFFICERS DIE IN ALASKA AIRPLANE CRASH

Two dental officers, Colonels in the Air Force and Army Dental Corps, were killed recently when a plane in which they were returning to Alaska crashed. The two, Lt. Col. Lawrence S. Singleton, DC, USA, and Col. Noel E. Hoblit, DC, USAF, have been reported missing and presumed dead.

Colonel Singleton, 48, was graduated from the University of Southern California dental school in 1929 and entered the Army Dental Corps in 1932. He was in civilian practice, 1945-50, specializing in orthodontics when he was recalled to active duty. He had been serving as chief of the Army Dental Service in Alaska and was returning from a visit to his home in Los Angeles.

Colonel Hoblet, 45, was graduated from St. Louis University dental school in 1938 and had specialized in prosthodontics. His home was in Illmo, Mo. He was serving as the Major Command Dental Surgeon for the Alaska Air Command and was also returning from a visit to the United States at the time of his death.

Veterans Administration

VA REORGANIZATION PLANS, MANAGEMENT REPORT ISSUED

In a reorganization now being conducted in the Veterans Administration, the VA chief of dental service will be one of four assistant chief medical directors in the Department of Medicine and Surgery, it was announced recently by Administrator Carl R. Gray, Jr.

The reorganization, which will extend to all departments of the agency, was

announced in conjunction with the publication of a 10-volume report of a VA management survey by the firm of Booz, Allen and Hamilton.

Changes will largely follow the suggestions made in the report; however, the management firm's recommendation that dental services be demoted to an administrative level with pharmacy, radiology and nursing has been rejected, Mr. Gray disclosed. Instead, the assistant chief medical director for dentistry will be on an administrative level with assistant chief medical directors for planning, operations and research and education.

A recurring suggestion in the Booz, Allen and Hamilton report is the recommendation that laws on non-service-connected disability cases be revised. The management firm points out that "lifetime care of the service-connected tooth . . . through custom, may extend . . . to a full set of service-connected dentures."

A.M.A. ASKS CONFERENCE ON ELIGIBILITY FOR VA CARE

The House of Delegates of the American Medical Association has asked that the American Dental Association and other interested organizations confer on the problem of VA treatment for veterans with non-service-connected disabilities.

At the A.M.A. meeting in Denver recently, the House of Delegates voted to adopt a report which stated "that the only honorable, equitable and reasonable way to approach the problem is to recommend . . . that the American Medical Association, the veterans organizations, the American Dental Association, the American Hospital Association, and representatives of the Department of Defense and the Veterans Administration sit down and try to reach reasonable conclusions for appropriate action from agreed upon data rather than take any precipitate action now."

The resolution was adopted after extensive debate. A special six-man committee which had studied the situation had previously reported that more than a half-million veterans with non-service-connected diseases had been treated in VA hospitals in 1951. This report, which was overruled by the reference committee, urged the curtailment of hospital services to all veterans with non-service-connected disabilities.

International

SWEDISH DENTISTS TO VISIT UNITED STATES IN APRIL

Two eminent dentists of Stockholm, Sweden, will visit the United States during April as guests of Northwestern University Dental School, it has been announced by Charles W. Freeman, dean of the School.

Henry Beyron, president-elect of the Swedish Dental Society, and Gosta Lindblom, well-known scientific investigator, will participate in three Northwestern events: the postgraduate course on occlusion, April 1-3, the graduate orthodontic alumni seminar, April 6-7, and the dental school homecoming program, April 8.

BELGIAN DENTAL SOCIETIES TO SPONSOR CONFERENCE

An international conference will be held in Belgium in May 1953 to mark the fiftieth anniversary of *Revue Belge de Stomatologie,* official publication of the Belgian Society of Stomatology and of the Association of University Licentiates and Dentists of Belgium.

Any member of the American Dental Association who may have an essay, table clinic or film to present to the dental conference may write immediately to the conference president, H. Priem, at 1, Place Prof Laurent, Gand, Belgium.

Robert Vivian Bradlaw (right), director of the Newcastle-Upon-Tyne Dental Hospital in England, is shown as he received an honorary degree in dental surgery from Msgr. Olivier Maurault, rector of the University of Montreal, Canada. Dr. Bradlaw, who earned degrees in dentistry and medicine at Guy's Hospital, London, is dean of Sutherland Dental School, University of Durham, and is founder of the Association of Dental Hospitals of Great Britain and Northern Ireland. He has recently lectured in New York and at the University of Oregon, as well as in Canada.

FEWER BRITONS SEEK DENTAL CARE FOR FEE

Since the British government imposed a charge of one pound (about $2.80) for dental treatment, persons who were accustomed to free service have not been seeking dental care, notes a recent issue of the British publication, *The Medical Press*.

Observing that the first three or four years of the National Health Service had been marked by a rush of dental patients, the editorial comments that the backlog had been dwindling and that many dentists were looking forward to doing conservative treatment. Since the charge was levied last summer, however, patients who formerly came for free treatment have not been visiting their dentists, the publication states.

EDITOR OF CANADIAN JOURNAL, M. H. GARVIN, RETIRES

M. H. Garvin of Winnipeg, editor of the *Journal of the Canadian Dental Association* since 1934, retired from that position recently, on his fiftieth anniversary as a dentist.

He has been a dental editor since 1911, when he was appointed associate editor of the *Dominion Dental Journal*. When that periodical ceased publication in 1934, the Canadian Dental Association founded its own official journal and Dr. Garvin became its editor-in-chief.

Dr. Garvin was president of the C.D.A. in 1929-30; he also has been president of the Winnipeg Dental Society, the Manitoba Dental Association, the Western Canada Dental Society and the American Academy of Periodontology. He is a fellow of the International College of Dentists.

In 1945 the Western Canada Dental Society established the M. H. Garvin Scholarship Fund at the University of Alberta in recognition of his service to Canadian dentistry.

F.D.I. TO HOLD MEETING JULY 25-AUGUST 1 IN OSLO

The 1953 annual session of the Federation Dentaire Internationale will be held July 26 to August 1 in Oslo, Norway, it was announced recently. The Federation, which was founded in Paris in 1900, holds annual sessions in various countries and sponsors the International Dental Congress, which convenes every five years.

General

ORTHODONTISTS' ASSOCIATION SIGNS F.T.C. AGREEMENT

The American Association of Orthodontists has agreed not to engage in actions cited by the Federal Trade Commission as tending to hinder competition, it was announced by the F.T.C. recently.

The Commission, in a complaint filed last July, charged that the American Association of Orthodontists had prevented dental laboratories from using trade publications to advertise "the supplies, devices and appliances used by dentists in the practice of orthodontia."

In consenting to the Commission's cease and desist order, the orthodontists stated that they "specifically refrain from admitting or denying that they have engaged in any of the acts or practices stated therein to be in violation of law."

ACADEMY FORMED TO PROMOTE POSTGRADUATE DENTAL STUDY

The Academy of General Dentistry will hold its first general meeting at 5 P.M. February 9 at the Conrad Hilton Hotel, Chicago. The primary purposes of the newly-formed organization are:

1. To stimulate interest in postgraduate study by the dentists in general practice.
2. To encourage better attendance at the various dental society meetings, especially branch meetings.
3. To help provide for and arrange postgraduate courses for the general practitioner, in cooperation with dental schools and societies.
4. To strive to maintain high standards in dentistry by the men in general practice.

Further information may be obtained by writing to A. L. Knab, secretary, 8500 Stony Island Avenue, Chicago 17.

FORMER CALIFORNIA DEAN, GUY S. MILLBERRY, DIES

Guy S. Millberry, former dean of the University of California dental school, died recently at the age of 80. Dr. Millberry was dean during 1914-40, after serving as superintendent of the school's infirmary, 1906-14. He was professor of chemistry and metallurgy for many years and was coauthor with Joseph D. Hodgen of the textbook, *Practical Dental Metallurgy.*

G. S. Millberry

SEMINAR GROUP FOUNDS DENTAL MEDICINE INSTITUTE

At the recent Seminar for the Study and Practice of Dental Medicine, Palm Springs, Calif., the Seminar's Board of Directors announced the founding of the American Institute of Dental Medicine. The Institute has been incorporated as a nonprofit organization under the laws of California "to further postgraduate education in the field of dental medicine."

The annual seminar will be one of the major functions of the organization. In addition, its members will receive a monthly case history from the field of dental medicine, together with original 35 mm. Kodachromes of the oral condition, pertinent laboratory findings, medi-

cal background, roentgenograms, histologic slides or other pertinent material, depending on the individual case. The service begins this month, January 1953. Any member of the American Dental Association, American Medical Association or their foreign equivalents is eligible for membership.

Further information may be obtained from Miss M. Lewis, executive secretary of the Institute, 2240 Channing Way, Berkeley 4, Calif.

VETERAN DENTAL LEADER, G. W. DICK, DIES

George William Dick, widely-known dentist of Sumter, South Carolina, died recently at the age of 88. He had been actively engaged in practice for more than 65 years.

A graduate of the University of Pennsylvania dental school in 1885, Dr. Dick was treasurer of the South Carolina Dental Association 1887-1902, president of the state society in 1903, a member of the state board of dental examiners 1892-1902, a member of the House of Delegates for many years and vice-president of the American Dental Association in 1925. He was a fellow of the American College of Dentists and was the first dental member of the South Carolina State Board of Health, on which he served for many years.

NEW YORK INSTITUTE TO MARK ITS 20TH ANNIVERSARY

The New York Institute of Clinical Oral Pathology will observe its twentieth anniversary on January 12, with a meeting at 8:30 P.M. in Hosack Hall of the New York Academy of Medicine, 2 East 103rd Street. Charles S. Cameron, medical and scientific director of the American Cancer Society, will speak on "Cancer: Retrospect and Prospect."

HORACE WELLS CLUB HOLDS 58th ANNUAL OBSERVANCE

The fifty-eighth annual meeting and dinner of the Horace Wells Club of Connecticut, commemorating the anniversary of the discovery of nitrous oxide anesthesia by Horace Wells 108 years ago, was held December 6 in Hartford, Conn.

James H. Halsey, president of the University of Bridgeport (Conn.), spoke on "The Expanding Role of Higher Education." Alden G. Newman, president of the club, presided.

ACADEMY OF ORAL PATHOLOGY TO MEET FEBRUARY 8

The American Academy of Oral Pathology will meet at its seventh annual conference February 8 at the Conrad Hilton Hotel, Chicago, just preceding the Midwinter Meeting of the Chicago Dental Society. The all-day program, which will begin at 9 A.M., is open to all interested persons.

NORTHWESTERN DENTAL ALUMNI PLAN LUNCHEON FEBRUARY 10

The annual luncheon of the Northwestern University Dental School Alumni Association will be held in the Grand Ballroom of the Conrad Hilton Hotel on February 11, during the Midwinter Meeting of the Chicago Dental Society. The class of 1928 will be honored during the luncheon program, which will be highlighted by an address by Rollin Posey, professor of political science at Northwestern University.

Tickets to the luncheon may be purchased before noon February 10 at the alumni association's headquarters in Room 557-A, Conrad Hilton Hotel. Reservations will be accepted at the Dental School, 311 East Chicago Avenue, Chicago 11, before the meeting.

The citizens of Croswell, Mich., have registered the claim of George Martin to the title, "oldest practicing dentist in the United States." Dr. Martin, who will be 92 on February 11, has practiced in Croswell since 1889, when he was graduated from the Philadelphia Dental College.

Dr. Martin is shown treating a 90 year old patient for whom he made a set of dentures 50 years ago. Four times daily, Dr. Martin walks three fourths of a mile to and from his second floor office. In his daily practice he scorns the modern electrical units with running water and attached waste receptacles, as he prefers a pump engine and stationary cuspidor.

Until two months ago, when he had five teeth extracted, Dr. Martin had most of his natural teeth. He drives a model A Ford on his occasional short vacations and helps his nephew with farming chores during harvesting. Farming is still his hobby he states, although he gave up his farm and herd of blooded Aberdeen Angus cattle five years ago.

LOYOLA ALUMNI PLAN CHICAGO MIDWINTER PARTY

The alumni of Loyola University School of Dentistry, Chicago College of Dental Surgery, will meet informally during the Chicago Dental Society's Midwinter Meeting. The party will take place 4:30-7:00 P.M., February 10 in the West Ball Room of the Conrad Hilton Hotel, Chicago. The Alumni Association has also announced plans for its seventieth annual Homecoming Banquet, to be held April 15 at the Congress Hotel in Chicago.

HISTORICAL BOOK PUBLISHED BY HARLAN H. HORNER

Harlan H. Horner, who was secretary of the American Dental Association's Council on Dental Education during 1940-48, has written an historical study, *Lincoln and Greeley*, which will be published January 9 by the University of Illinois Press. It is the January book club selection of the American History Publication Society.

Dr. Horner is best known in the dental profession as the first secretary of the reorganized Council on Dental Education. His book, *Dental Education Today*, was written while he was secretary of the Council on Dental Education and was published in 1947 by the University of Chicago Press.

Dr. Horner retired in 1948 to devote his full time to collecting and documenting Lincoln materials. His first book on Lincoln, *The Growth of Lincoln's Faith*, appeared in 1939.

KANSAS CITY DENTAL ALUMNI PLAN 72nd MEETING

The seventy-second meeting of the Alumni Association of the University of Kansas City School of Dentistry, Kansas City-Western Dental College, will be held March 9-10 at the Hotel President. All members of the American Dental Association have been invited to attend.

THOMAS S. EADER, CALLED OLDEST ACTIVE DENTIST, DIES

Thomas S. Eader, 92, believed to have been the oldest practicing dentist in the United States, died December 14. A graduate of the University of Maryland dental school in 1882, Dr. Eader had practiced in Frederick, Md., for more than 70 years, missing only two days through illness.

T. S. Eader

He was a charter member and past president of the Frederick County Dental Association and served as president of the Maryland Dental Association during 1927-29.

ROWE SMITH, PERIODONTIST OF ARKANSAS, DIES

Rowe Smith of Texarkana, Ark., chairman of the Association's section on periodontics, recently died at the age of 54. A graduate of Vanderbilt University dental school in 1923, he completed his periodontics training at Stillman-McCall Clinic, New York; Northwestern University and the University of Vienna, Austria.

Rowe Smith

He was active in the American Academy of Dental Medicine, the International College of Dentists and the American College of Dentists.

Also . . . The Washington University (St. Louis) dental alumni will hold their eighty-seventh annual reunion in the dental school February 21. A full day of clinical programs and a banquet will constitute the program, according to alumni secretary-treasurer, V. P. Thompson of Webster Groves, Mo. . . . The American Dental Society of Europe will meet August 4-7, 1953, in Bergen, Norway. Further information may be obtained from F. Douglas Derrick, secretary, 140, Park Lane, London, W. 1, England. . . . Abstracts of research studies will be presented during the next meeting of the American Association of Orthodontists, to be held April 26-30 at the Baker Hotel, Dallas, Texas. Researchers who wish to have their studies included may submit applications before March 15 to John R. Thompson, 311 East Chicago Avenue, Chicago 11. . . . The first issue of the Michigan State Dental Association's new *News Letter* was distributed December 1. . . . The American Dental Association has protested the recent television skit which ridiculed dental technic and criticized dental fees. The satiric sketch was presented on the program, "Show of Shows," and drew immediate protests from many dentists. . . . The New Jersey Society of Dentistry for Children is now publishing a periodical *Bulletin*. Louis B. Kelsten of Newark is editor.

The Reader Comments

THE JOURNAL *devotes this section to comment by readers on topics of current interest to dentistry. The editor reserves the right to edit all communications to fit available space and requires that all letters be signed. At the request of the author, signatures will be deleted before publication. Printed communications do not necessarily reflect the opinion or official policy of the Association. Your participation in this section is invited.*

The Editor

CRITICISM OF GRAPHIC STUDY OF MANDIBULAR MOVEMENT

Much of the experimental work on the subject of mandibular movement has been carried out by the graphic method, in which various pointers are made to trace the paths of their movements on suitable plates. These pointers are located as close as possible to those points in the mandible whose movement it is desired to study.

The method has thrown considerable light on the problem but must be used with care if entirely misleading results are to be avoided.

A study of the work of one investigator will illustrate the pitfalls that lie in the path of anyone using the graphic method of investigation. The work of Kurth[1] has been chosen, not because this is more open to criticism than that of other investigators, but because it is comparatively recent and is one of the most extensive. It also appears to have been accepted by the profession, if one can judge by the frequent references to it in the literature and by the fact that it won for him the Chicago Dental Society Essay Award of 1942.

Kurth's Investigation • Kurth constructed a machine to trace the movements of the mandible at three points. One was situated at each condyle and one in the incisor region. He traced the movements of each in three planes—one transversely vertical, one horizontal and one sagittal.

It is helpful to picture Kurth's tracings as being made upon the two walls and the floor, in the corner of a room (Fig. 1). If parallel beams of light were to shine vertically downward from the ceiling upon a small object (such as a fly) moving in space, it would trace out a path with its shadow on the floor (horizontal plane). Parallel beams of light shining similarly at right angles towards each wall would cause a shadow path of the object to be traced on each of these.

If we were directly facing one wall we should be looking at the equivalent of Kurth's transverse vertical plane from the same direction as he would view it if looking directly at his patient. The wall at our side would now represent his sagittal plane.

Plotting the movement • Here it may be said that Kurth gave himself an unnecessary amount of work. He need only have traced the movement of his points in any two planes. The third tracing was unnecessary and could have been calculated from the first two, as can easily be seen by reference to the object moving in the corner of the room.

If this object traveled from a point 1 ft. up from the floor and 1 ft. from the back wall (transverse vertical plane), to a point 5 ft. from the floor and 5 ft. from the back wall, it would trace a path on the side wall (sagittal plane) as shown in Figure 1.

This tracing gives the horizontal and vertical dimensions of its movement. It can easily be seen to have advanced 4 ft. while rising 4 ft. A shadow path traced simultaneously on the back wall is all that is necessary to give the required information about the actual movement in space. It not only repeats the vertical dimension but shows that the object started 2 ft. away from the side wall and traveled 3 ft. further away from it during the movement.

From these two shadow paths, the path on the floor (horizontal plane) can be plotted by dividing each wall into an equal number of parts, dropping perpendiculars to the floor from each point and continuing these lines across the floor at right angles to their respective walls until they meet.

The intersection of these lines will give corresponding points on the floor, and these points may be joined to form the floor path. In a similar way the path on one wall can be worked out from a knowledge of the path traced on the other wall and on the floor.

Any two of Kurth's planes would therefore have been sufficient, but his inclusion of the

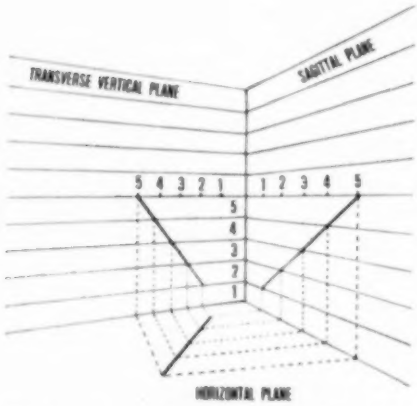

Fig. 1 • Corner of room showing the path of an object moving in space related to the walls and floor

third makes it easier to understand the errors of the method.

Differences in Vertical Measurements • In order to appreciate these inaccuracies it is well to look at Figure 1 again. The vertical dimension shown both on the back wall and on the side wall must of course be the same on each.

Now Kurth's equivalent tracings (transverse vertical and sagittal) should also show the vertical dimension as identical in each. From Figure 2, however, which reproduces his first set of tracings, it can be seen that the vertical dimensions in the transverse vertical and sagittal planes in no way correspond.

Those who can refer to the article under review, will see that similar errors occur throughout. Comparisons should be made on the following basis:

Fig. 2 • Tracings obtained by Kurth at the right condyle point during a right lateral mandibular glide. The C with arrow points to the beginning of the movement from the position of centric occlusion. (From Kurth's article "Mandibular Movement in Mastication," J.A.D.A., October 1, 1942, p. 1772. Top row of tracings from Fig. 4.)

1. Vertical movement in transverse vertical plane should equal vertical movement in sagittal plane.
2. Lateral movement in transverse vertical plane should equal lateral movement in horizontal plane.
3. Backward and forward movement in sagittal plane should equal backward and forward movement in horizontal plane.

Reverse direction • Some of the most striking examples of discrepancy are to be found in Figures 14, 15 and 16, where, according to Kurth "the characteristics of the opening movement . . . demonstrated that the right condyle moved upward in the transverse vertical plane . . . and downward and forward in the sagittal plane. The directions of movement for the left condyle were similar. . . ." This is no more possible than it would be for the insect in the corner of the room to fly in two opposing directions at one and the same time.

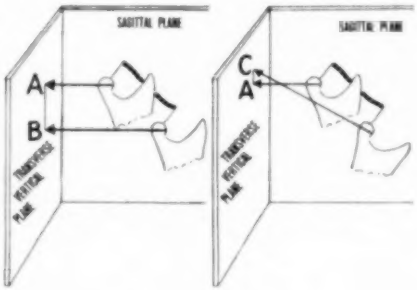

Fig. 3 • Left: Path AB reproduces the true vertical movement of the condyle in the transverse vertical plane if no rotation of the condyle is present. Right: A rotating downward forward movement of the condyle produces AC, a false tracing of vertical movement in the transverse vertical plane

Rotatory Difficulties • Limitations of the graphic method are most easily seen from a study of Kurth's condyle tracings during opening movements of the mandible. These are the tracings that led him to the impossible conclusion already mentioned, namely, that the condyles move upward when viewed from the front and, at the same time, downward when viewed from the side.

Figure 3a shows one of Kurth's condyle tracings in the sagittal plane and the posi-

tions of the condyle at the beginning and at the end of its movement. On the left of the diagram is shown the plate on which tracings were made in the transverse vertical plane.

Now, if the condyle had moved downward and forward without rotation, the path drawn in the transverse vertical plane would have shown a downward drop AB equal to the downward drop registered in the sagittal plane.

In fact, however, the condyle in moving downward and forward rotates as indicated in Figure 3b. This tilts the stylus so that its point moves upward. This small error is greatly exaggerated by the fact that the stylus must be lengthened in order to keep it in contact with its plate, from which the forward movement of the condyle would otherwise separate it.

This tilting and elongation of the stylus can easily result in a tracing AC (Fig. 3b) that runs in the opposite direction from the true movement of the point under investigation, so that the result is entirely misleading.

The opening movement that has just been considered is a simple one. It normally takes place almost entirely in the sagittal plane and styluses working at right angles to sagittal plates will therefore remain at right angles to them and will describe accurate tracings. Errors due to the slight lateral deviation that often occurs as part of an otherwise normal movement may creep in but will be small.

Styluses working on transverse vertical and horizontal plates, on the other hand, will be turned out of perpendicular position by the rotatory element of the opening movement and will produce distorted tracings. The same applies to tracings of a protrusive glide. Of these, sagittal tracings can be expected to be accurate and all others false, although the smaller amount of rotation results in a smaller degree of error.

Lateral movements are different. These are not limited to any one plane but invariably take place in all three dimensions, with the result that all styluses will be turned out of right angles and will produce distorted tracings. The distortion that occurs in such tracings makes their true interpretation extremely difficult and no conclusions can be based upon them unless a method of applying corrections is worked out.

Conclusions • The graphic method of investigating mandibular movements has limitations that make it of little value except where the tracings are made in a plane parallel to the direction of the movement being studied.

This condition can only normally be fulfilled by tracings made in the sagittal plane during mandibular movements performed without any lateral deviation; namely, opening and closing, protrusion and retrusion, or a combination of these.

A. O. Chick, University of Bristol, England

1. Kurth, L. E. Mandibular movements in mastication. J.A.D.A. 29:1769 (Oct. 1) 1942.

REPLY TO A. O. CHICK'S COMMENTS

It is always an honor for a writer to have his endeavors singled out for criticism or commendation, especially if the discusser is from a foreign land. It is also true that differences in nomenclature and connotation of words may sometimes confuse the foreign critic. This, however, does not seem to be the case in the article written by Dr. Chick. He is a senior lecturer on prosthetics at the University of Bristol Dental School, Bristol England, and should be acquainted with American thoughts and technics in relation to research.

Chick's Method • The usual method for the evaluation of any research problem is the use of the same or similar instruments and methods of the original author, in an attempt to verify or disprove his conclusions. The discusser usually observes the rule that he note the basic assumptions of the investigator. Dr. Chick has entirely ignored this fundamental precept of intellectual honesty in interpretation. The opening paragraph of my article on "Mandibular Movements in Mastication" states:

"It will be the aim of this paper to present clearly by means of graphic tracings and stroboscopic pictures the entire phenomenon of the *direction* of mandibular movement in three dimensions of space in its relation to the physiologic art of mastication."[1]

The problem which I undertook for this research was therefore limited to the direction of the mandibular movement and did not concern itself with its magnitude or extent. It is inconceivable to me why Dr. Chick would deliberately discuss the magnitude or extent of movement in relation to my study, putting the direction in a minor capacity.

Plotting the movement • Dr. Chick's description of the movement of a fly in a room is high school mathematics which every dentist knows. I discuss my reasons for using three planes below.

Fig. 1 • Sagittal view of specially designed facebow. The three planes can be readily seen in the condylar region, and the method for obtaining the three dimensional tracings at the incisor point is easily discernible

Differences in vertical measurement • Dr. Chick's rule for comparison of the various tracings, "vertical movement in transverse vertical plane should equal vertical movement in the sagittal plane," and so forth, would be pertinent if we had been interested in the magnitude of the movement and had therefore utilized a device which would yield this information. Perhaps Dr. Chick spent more time with his ruler measuring the tracings in my article than he did in reading the text.

Figure 1 depicts the tracing devices used in my research, together with the original caption. It is evident to even the most casual observer that in graphing the mandibular movements at the three points, individual tracings could be made in three dimensions by three *different* styluses. The tracings in the condylar region were obtained from styluses which were placed as near one another as possible, separated by the thickness of the styluses in their respective tubings. This separation would, of course, make a difference in the magnitude of the tracings in the condylar region.

The transverse vertical and sagittal tracing plates had to be placed at a much lower level than the horizontal plane at the incisor point. This arrangement enabled the patient freedom of movement in all mandibular excursions, and did not alter the general direction of these tracings, although their magnitude would be different from those obtained at the same level with the horizontal tracing.

Three planes defended • As the tracings are being recorded on a flat plane, it is a physical impossibility to graph the movement of a stylus going in three directions simultaneously. This recorded direction is both projected and referred anyway, as the condyles which are the origin of this movement are covered by tissue and cannot be directly graphed.

Therefore, all evidence gathered on condylar or mandibular movement is empirical in nature. As such, it is far more intelligent to take the tracings of the projections of these movements, in the three coordinate planes of reference, than it is to take the tracings in only two planes and hypothesize its direction or magnitude in the third plane. It is highly unlikely that the locus of the moving point can be described by mathematical means in two of the three coordinate planes. Therefore Dr. Chick's geometrical procedure for determining the projection in the third plane becomes extremely questionable. In his analogy of a straight line in space it is only necessary to use two projections to arrive at the third geometrically. I am convinced that he is aware that mandibular movement is not this easy to describe.

Stroboscopic photographs for verification • If Dr. Chick had carefully read the text he would have found on page 1771, this statement:

"Previous studies utilized various methods from direct observation to the graphic or photographic method, all of which have advantages and disadvantages. The graphic method for tracing mandibular movement is employed in this study because this method is used clinically in dentistry. Stroboscopic photographs were also utilized to verify the movement of the incisor point".

At no place in his discussion did he mention the fact that the direction of movements at the incisor point were verified by the photographic method.

Reverse picture of direction • I wish to commend his interpretation of the tracing on the direction of movement on the transverse plane in the condylar region when the mandible is opened and in a masticatory stroke. His conclusions, however, reject methods accepted in the United States for

obtaining centric relation. He states that, "The only tracings of such movements that can be regarded as accurate are those also made in the sagittal plane." It is well known that the graphic method of obtaining centric relation by means of the gothic arch or arrow point tracing is made at the incisor point in the horizontal plane. Dr. Chick is therefore condemning this accepted clinical practice as worthless and a distortion. The majority of these tracings are taken with the stylus in the maxilla and a graphic plate on the mandible. This, of course, gives a reverse picture of what actually occurs when the apex of the gothic arch, or centric relation, which is the most retruded position of the mandible, is graphed in an anterior position, while the protrusive and lateral movements are traced posteriorly.

This phenomenon does not confuse freshman students at American dental colleges. However, Dr. Chick would condemn such a practice as "no more possible than it would be for the insect in the corner of the room to fly in two opposing directions at one and the same time." I suggest to Dr. Chick that he carefully reread my article.

Conclusions • The graphic method admittedly has disadvantages, but these same disadvantages furnished a means of comparison between the components of mastication and the actual masticatory cycle.

Definite conclusions can be drawn, to demonstrate that there are differences between the mandibular glide and masticatory stroke.

I hope this discussion will bring more work on this subject to help solve the problem of mandibular movement. I submit that Dr. Chick's conclusions and his condemnation of the graphic method are not substantiated by accepted dental practice.

L. E. Kurth, D.D.S., Chicago

1. Kurth, L. E. Mandibular Movements in Mastication. J.A.D.A. 29:1769 (Oct.) 1942.

JUNE JOURNALISM CONFERENCE TERMED EFFECTIVE

Several issues of the Pennsylvania Dental Journal have been published since Dr. Paul E. Bomberger and I attended the excellent Conference on Dental Journalism sponsored by the Council on Journalism. We believe these issues reflect a substantial improvement over former ones, and the acceptance by our membership has been excellent.

These things were brought about, of course, because of the instructions and impressions both Dr. Bomberger and I were able to take away from the Chicago session, and we want to thank you and everyone who had anything to do with the planning of the Conference. It was certainly one of the most profitable and enjoyable conferences that we have ever attended. Its direct and good effect on the efforts and programs of state dental societies makes it extremely worthwhile.

Ray Cobaugh, Harrisburg, Pa.

REST POSITION OF THE MANDIBLE

In your issue of January 1951, W. R. Eberle credits first mention of the term "rest position of the mandible" to M. E. Niswonger in 1934. I have the greatest admiration for Niswonger's contributions to this subject; but he would probably not wish to be credited with something which he did not originate. An earlier use by N. G. Bennett will be found in the *Proceedings of the Royal Society of Medicine* (Section of Odontology) April, 1908, page 79.

F. W. Craddock, Dunedin, N. 1, New Zealand

USE OF MEPHENESIN DEFENDED

I would like to comment on the opinions expressed by A. T. Rasmussen in the November issue of THE JOURNAL concerning my article, "The Dental Use of Mephenesin in Cerebral Palsy Patients," which appeared in the August 1952 issue.[1]

Many of the statements expressed by Dr. Rasmussen are somewhat confusing and do not exactly hold water.

A few years ago mephenesin was used intravenously in 10 per cent solutions to obtain a curare-like effect. This produced hemolysis of the blood and was discontinued. A 2 per cent solution of mephenesin, utilizing 1-2 Gm., is now administered intravenously and does not produce any curare-like effect.

The only time when mephenesin can produce a curare-like effect is when it is given in doses far in excess of the ordinary therapeutic doses. Mephenesin causes the abnormal activity of the skeletal muscles to be depressed but has no influence on voluntary muscle movement; in addition it produces no temporary paralysis, as stated by Dr. Rasmussen.

Mephenesin in a single dose of 0.5 Gm. per 50 pounds of body weight was used in the preliminary study, as described throughout

the report. In my final report, to be completed soon, the dose was doubled and tripled without any disturbing effects.

The method of administration, as the preliminary report stated, was through the use of the elixir of mephenesin in a single dose. The only point at which mephenesin assumes any local anesthetic action is at the point of administration.

Dr. Rasmussen has reason to be concerned, as I am, about the table headed, "Administration and Effect of Mephenesin in the Treatment of Cerebral Palsy." The findings as originally presented to THE JOURNAL were reported in fractions of a gram. The highest single dose given to any one individual was 1 and ¾ grams. The table showing dosage was returned to me with a request to correct the fractions of grams to metric doses.

Unfortunately, through an office error, the doses were calculated and listed in grains, instead of grams. Through a typographical error in the printing of the article, all doses were listed under the heading of grams. This was unfortunate, as my findings were true and thoroughly carried out.

If readers will turn to page 169 of the August, 1952 issue of THE JOURNAL and will change the fifth column heading to "dosage in grains" rather than "dosage in grams" the table will be correct.

I hope that this will clarify the printing error that was made concerning the doses listed in the patient evaluation chart. Mephenesin, I feel, has a definite place in dentistry in all its many phases.

Manuel M. Album, D.D.S.

1. Album, Manuel M. The dental use of mephenesin in cerebral palsy patients: a preliminary report. J.A.D.A. 45:165 (Aug.) 1952.

Book Reviews

THE TEMPOROMANDIBULAR JOINT

Edited by Bernard G. Sarnat and Edward J. Ryan. Contributing authors: Allan G. Brodie, Harry Sicher, John R. Thompson, Joseph P. Weinmann and Arnold A. Zimmerman. 165 pages with 62 illustrations. Price $4.75. Springfield, Ill., Charles C Thomas, 1951.

The material presented in this book was offered through the postgraduate division of the University of Illinois College of Dentistry during April and May of 1949. Thus, the monograph represents the combined efforts of many individuals who have given considerable time and effort to make detailed studies of the temporomandibular joint and related structures.

Derangements of the joint arise from varied factors; to make a correct diagnosis we must depend on an understanding of the normal structure and function as well as the pathologic physiology of the masticatory system.

The first chapter, by Sicher, deals with the functional anatomy of the joint presented clearly, with excellent illustrations. The second chapter, by Weinmann and Sicher, adds character to the first by discussing the histophysiology of the joint. Allan Brodie discusses the contribution of the mandibular condyle to the growth of the face and Weinmann and Sicher cover pathology of the joint.

Chapter five, in which Zimmerman evaluates Costen's syndrome, is an especially interesting presentation. Costen's syndrome is repeatedly referred to in the literature even today, when we know various symptoms he described and attributed to the joint could not be true. The fallacy of this concept is ably demonstrated by Zimmerman in his evaluation of the syndrome.

The final two chapters by Brodie and Thompson respectively deal with diagnosis and treatment.

Surgical disorders are not dealt with and the discussion is directed more toward functional derangements due to malocclusion; however, it was pointed out in the preface that the monograph was not intended as a complete review but rather as a basis for critical evaluation and further study. It is fortunate that some of the older concepts have been pointed out and shown to be fallacies rather than accepted at face value. The text is a valuable addition to the modern dental library.

L. F. Aseltine

THEORIE UND PRAXIS DER PARTIELLEN PROTHESE

By Josef Vachuda and Rudolf Lenk. 472 pages with 67 illustrations. Index. Vienna, Verlag Wilhelm Maudrich, 1952.

The first part of this volume, *Theory and Practice of Partial Prosthesis*, is a review of the early history of prosthodontics, its origin, its development during the Middle Ages, the work of Pierre Fauchard, the various types of teeth, bridges and dentures used during the nineteenth century and the progress made in the first half of the twentieth century.

The main part of the volume is devoted to current theories and methods of constructing partial dentures. Problems discussed in detail include dental materials; determinations of load and methods of anchorage; hygienic, biological and cosmetic considerations; selection of materials; steps in construction; transference, insertion and adjustment of partial dentures.

Grace Nichols

A SURVEY OF THE LITERATURE OF DENTAL CARIES

Prepared for the Food and Nutrition Board, National Research Council, by Guttorm Toverud, Gerald J. Cox, Sidney B. Finn, Charles F. Bodecker and James H. Shaw. 567 pages with 87 illustrations. Bibliography. Price $3. Washington, D. C., National Research Council, 1952.

This monumental work, product of a 10 year project of the National Research Council, contains reviews of the literature from which we draw our present knowledge of dental caries. It is a tribute to all who were concerned with its preparation—the five eminent authors, the consultants and the staff of the National Research Council's Food and Nutrition Board, which prepared the volume for publication.

Sections on experimental caries in animals, oral environment and caries, and fluorine and caries were written by Gerald J. Cox. The section on prevalence of dental caries is by Sidney B. Finn. Charles F. Bodecker composed a section on pathology of caries, and James H. Shaw wrote one on nutritional factors.

These six sections of interpretive reviews are preceded by Guttorm Toverud's interest-

ing 53-page introduction. A bibliography of more than 2,000 references is included at the end of the book.

The goal of the project has been accomplished with remarkable success. In the words of A. LeRoy Johnson of the National Research Council, "Bringing together in historical perspective accounts of work that has been done provides, in tangible form, the sources and nature of investigations upon which present knowledge of dental caries rests. It reveals the situation as it is today."

The value of such a project is obvious; its achievement is a milestone in the dental literature.

The news of this book's publication in November 1952 revealed that financial assistance by corporations and trade groups had enabled the National Research Council to offer it for purchase at $3.00. Dentists may order it from the publications office, National Research Council, 2101 Constitution Avenue, Washington 25, D. C., with remittance payable to the National Academy of Sciences.

APHORISMS OF CHARLES H. MAYO AND WILLIAM J. MAYO

Collected by Frederick A. Willius, M.D., First edition. 109 pages with two illustrations. No index. Price $2.75. Springfield, Ill., Charles C Thomas, 1951.

This is a collection of 215 pithy sayings and aphorisms from the complete writings of the Doctors Charles H. Mayo and William J. Mayo of the Mayo Clinic, Rochester, Minnesota.

As stated in the introduction, it seemed desirable to record these "pearls of wisdom" in a small volume, readily accessible to those who did not know the Mayo Brothers, and to the generation of physicians to come. These medical maxims are divided into two groups, each group being supplemented with excellent references.

Exclusive in the book is the so-called Lost Oration by Dr. William J. Mayo before a committee of the Minnesota State Legislature on March 22, 1917. These extemporaneous remarks, set down by newspaper reporters present, are a powerful and eloquent expression of the ideals of the Mayo Brothers.

Dr. Willius is to be congratulated on this monograph. The publisher is also to be complimented for producing an inexpensive book that contains legible type and sturdy paper. The book is well worth reading, as a rich source of inspiration.

E. Alan Lieban

EXPLORACION CLINICA EN ESTOMOTOLOGIA Y SU INTERPRETACION (CLINICAL EXAMINATION IN DENTISTRY AND ITS INTERPRETATION)

By I. Saenz de la Calzada. 486 pages with 372 illustrations, 10 in color. Index. Price 230 pesetas. Madrid, Spain, Editorial Paz Montalvo, 1951.

This book was needed to fill a void in the Spanish dental literature. As indicated in the title, the book is devoted entirely to the various methods employed in clinical examinations for the purpose of arriving at a satisfactory diagnosis. Most of the modern instruments and methods available today are described.

While the author does not delve into detailed descriptions of the various pathologic conditions, he considers them objectively and explains them concisely.

The book is well written, the explanations are lucid and it is easily read. The author has chosen, organized and presented his material well, in logical sequence. In addition, the type is easy to read and the paper is of exceptionally fine enameled stock; by and large, the illustrations are well reproduced. There is an excellent table of contents and an index well organized and arranged for quick reference. Each of the fourteen chapters is preceded by a brief outline of its contents and at the end of each the author evaluates the various methods employed.

The chapters include the general examination of the patient, the teeth, the periodontal and gingival tissues; also the cheek, tongue, and the floor and roof of the oral cavity.

Consideration is also given to the examination of the various fluids of the oral and oral-pharyngeal cavities.

In chapter eight, the author discusses the accidental and pathologic fractures of the bones of the head in addition to the various temporomandibular joint disorders. Methods for the examination of the maxillary sinuses and other facial and nasal cavities are likewise considered. The technics and interpretations of intraoral and extraoral roentgenography as well as laminography are discussed. Chapters 12 and 13 present a thorough overall presentation of examinations involving the cardiovascular system, the lungs and other internal organs.

The various tests employed in the laboratory for the purposes of urine analysis, basal metabolism determination and the histopathologic examinations are also given.

All in all, it is a book that should be well received by Spanish reading dentists.

Stanley D. Tylman

BEGIN NOW—TO ENJOY TOMORROW

Ray Giles. Second edition. 57 pages with illustrations. Published as a public service by Mutual Benefit Life Insurance Co., Newark, N. J., 1951.

Today's complicated economic conditions, coupled with dentists' non-participation in the Social Security program under prevailing laws, make the subject of planning for later years an important one for dentists. This book discusses types of retirement income provided by life insurance, annuities, or by some other plan of saving.

The thesis of this book is the assurance that happy, rewarding years can result from careful planning. The author first asks, "What are you doing, right now, to make sure you'll be happy, active and useful as long as you live?" Then follow constructive suggestions for planned retirement, summarized in seven general rules which, in this reviewer's opinion, are basically sound.

These rules state that one should begin financial preparation early, make useful and interesting activity the cornerstone of your plan, continuously widen your horizon, be socially useful, obey now the rules for healthful living, observe the rules of mental hygiene and discuss retirement with your work associates, your friends and your wife, to improve the quality of your planning. The best of all rules for a happy and successful retirement seems to be "Retire To—Not From." Questions to check are concerned with interesting hobbies and activities for spare time, which might help the community or the world at large. The final chapters are concerned with economic cycles and contain a splendid retirement time table.

This reviewer feels that Mr. Giles has written a book in which the dentist will find an honest approach to many of his economic and social problems.

Lloyd H. Dodd

X-RAYS IN DENTISTRY

Twelfth edition. 80 pages, with 47 figures. Rochester, N. Y., Eastman Kodak Co., 1951.

This popular manual is now in its twelfth edition. In 20 years well over a quarter of a million copies have been published. It is exceptionally well illustrated from the standpoint of the use of roentgenograms in the dental office, and the reproduction of the individual films is superb. It includes sections on roentgenographic materials for the dental office, the principles of exposure and safety measures. The anatomical aspects of dental roentgenography are beautifully illustrated and fully documented. The section on roentgenographic technic describes the standard method, for use with an eight inch target-skin distance. The illustrations show, side by side, diagrams of head position, photographs of packet placement, photographs of cone placement and diagrams of angulation with illustrative roentgenograms. It is particularly helpful to be able to see each of these illustrated on the same page. The concluding section on processing presents the essential fundamentals and is well illustrated. The twelfth edition of this compact, useful book offers a handy manual of dental roentgenographic technic.

William Ward Wainwright

THE PORCELAIN JACKET CROWN

By Charles Brecker. First edition. 263 pages with 290 illustrations and frontispiece in color. References and index. Price $8. St. Louis, C. V. Mosby Co., 1951.

Dr. Brecker has provided a most useful teaching manual on the subject of the porcelain jacket crown, for the use of both graduate and undergraduate dentists.

This is another of those profusely illustrated dental texts describing technical procedures that have become so popular of late. There is no doubt that they are contributing much to the greater ease and simplicity of understanding through the visual sense. The value of teaching from enlarged photographs of "true to life" operations within the mouth is second only to that of a clinical demonstration on a patient.

The first five of the manual's eight chapters are largely devoted to verbal and photographic description of the author's step-by-step technic of preparing any tooth—whether of normal or abnormal form, condition or position in the mouth—for a porcelain jacket crown. Special emphasis is given to the treatment of malposed and malaligned teeth through the medium of case reports.

Especially good are the photographic illustrations of the preferred positioning of the patient's head and the operator's hands and fingers when using either the straight or contra-angle handpiece containing a recommended shape and size of disc, stone or bur for obtaining a proper preparation on the several surfaces of the various teeth. A small line drawing beneath each photograph serves as a close-up of the tooth under preparation and

adds greatly to the verbal explanation of the desired form. A few of these line drawings seem to be inaccurate, especially in the shoulder area, and are not in conformity with the worded instructions. For example, the initial buccal shoulder cut shown on page 115 is much wider than that shown of the same case when finished on page 117.

Chapter six describes adequately impression taking, color, care of the preparation and cementation. Chapter seven discusses the common shortcomings of the porcelain jacket crown, such as abnormal soft tissue conditions in the gingival area and fracture of the porcelain. The final chapter gives brief and practical comments and instructions on the use of porcelain in the construction of fixed bridges.

Harold W. Oppice

TRATTATO DI ODONTOLOGIA, VOL. II
(ENCYCLOPEDIA OF DENTISTRY)

By Silvio Palazzi. Fourth edition. 1,225 pages with 724 illustrations, 154 in color. No price listed. Milan, Italy, Ulrico Hoepli, 1951.

This volume, by the director of the University of Milan dental school and clinical director of the University of Pavia, deals mainly with the specialized branches of dentistry. In 33 chapters, Dr. Palazzi has attempted to compile the knowledge of many outstanding authors under one cover. This reviewer was particularly interested in the chapters on oral surgery, prosthetics and crown and bridge technics.

The chapters on oral surgery and prosthetics (which is separated into full denture and partial denture technics) are clear and constructive, and show that the author selected his material carefully so as to deal with the major, rather than the minor, cases handled by general practitioners and specialists.

In his chapters dealing with porcelain jacket and crown and bridge technics, Dr. Palazzi has used Dr. Tylman as his major source of information and has offered his readers much valuable information. The chapters pertaining to orthodontics are too few, although they are well illustrated with drawings and photographs.

I was pleased to note that two chapters were given over to acrylic restorations, especially the processing of labial and buccal surfaces with acrylic in full cast and shell gold crowns. As for the use of Class II acrylic restorations, I must, of course, disagree.

The bibliography contains the names of over 1,900 authors. This great number in itself shows the enthusiasm of Dr. Palazzi and his collaborators to give to the Italian dental profession two volumes on the latest scientific and practical information open to their field as of June 1951, so easily accessible to us in the United States, but in most instances inaccessible in many countries.

Dr. Palazzi and his collaborators are to be congratulated on having had the perseverance to complete such an arduous and worthwhile task.

Frank M. Amaturo

BIBLIOGRAPHY OF MEDICAL EX LIBRIS LITERATURE

By Samuel X. Radbill, M.D. 40 pages and 16 plates. Price $4.50. Los Angeles, Hilprand Press, 1951.

This fine contribution to the literature of bookplate collecting is perhaps the first bibliography of a specialized interest in the *ex libris* field. The author is widely recognized as an authority on medical bookplates, and his book will undoubtedly stimulate veteran collectors and recruit others among physicians, dentists and pharmacists. The medical *ex libris* is an interesting medium for the picturization of the healing arts historically and symbolically. Many physicians have designed their own *ex libris*, and the Arts Exhibits at recent AMA meetings have included a number of interesting *ipse fecit* plates.

Dr. Radbill's book contains a listing of the published contributions to the literature on medical *ex libris*. Although the literature on dental *ex libris* is sparse, the author includes five dental references, all of them European. The bibliographical notes are informative and provocative and should serve as an effective source of guidance to the collector. The volume will prove valuable to dentists who are already ex-librists and to those of the profession who are seeking a good hobby associated with the field of graphic arts.

The 16 plates—would that there were many more—form a carefully selected representation of the medical bookplate. They include designs by Henri-Andre and Arthur W. Clark and the *ex libris* of such collectors as Emanuel Bergman, Herman T. Radin, and Edwin S. Potter. The designs illustrate the use of various devices—mottoes, macabre motifs, serpent emblems, allegorical figures and heraldic elements—characteristic of the bookplates of physicians.

Gardner P. H. Foley

BOOKS RECEIVED BUT NOT REVIEWED

A 40 YEAR CAMPAIGN AGAINST TUBERCULOSIS • Louis I. Dublin, Ph. D. 115 p. Illus. Metropolitan Life Insurance Co., New York, 1952.

MODERN TRENDS IN INFANT NUTRITION AND FEEDING • Jonathan T. Lanman, M.D. 168 p. Sugar Research Foundation, Inc., 52 Wall St., New York 5, May, 1952.

CORRELATIVE NEUROANATOMY AND FUNCTIONAL NEUROLOGY • Joseph J. McDonald, M.S., M.Sc.D., M.D., and Joseph G. Chusid, A.B., M.D. Ed. 6. 263 p. 177 illus. $4. Lange Medical Publications, University Medical Publishers, P. O. Box 1215, Los Altos, Calif., 1952.

FEEDING LITTLE FOLKS • E. T. McEnery, M.D., and Margaret Jane Suydam, Home Economist. 21 p. Illus. National Dairy Council, 111 N. Canal St., Chicago, 1952.

NATIONAL BLOOD PROGRAM PUBLICITY MANUAL • 65 p. National Blood Program, Office of Defense Mobilization, Executive Office of the President, Washington 25, D. C.

MEDICAL MYCOLOGY: AN INTRODUCTION TO ITS PROBLEMS • G. C. Ainsworth, B.Sc., Ph.D., F.L.S. 107 p. 7 illus., 8 plates. $2.75. Pitman Publishing Corporation, 2 W. 45th St., New York, 1952.

CORTONE: A HANDBOOK OF THERAPY • Merck & Co., Inc., 129 p. 31 illus. Merck & Co., Inc., Box 22, Rahway, N. J.

HOW TO MAKE OUT A DOCTOR'S OR DENTIST'S INCOME TAX RETURN • Paul Gitlin. 36 p. 16 illus. Prentice-Hall, Inc., 70 Fifth Ave., New York, 1952.

PHYSIOLOGICAL CHANGES IN PLASMA PROTEINS CHARACTERISTIC OF HUMAN REPRODUCTION: CROSS-SECTIONAL AND LONGITUDINAL ELECTROPHORETIC DATA FOR WOMEN DURING AND FOLLOWING UNCOMPLICATED AND COMPLICATED PREGNANCIES • Icie G. Macy, Ph.D., Sc.D., and Harold C. Mack, M.D. 170 p. 14 illus. Children's Fund of Michigan, 660 Frederick St., Detroit.

THE NATURE OF SOME OF OUR PHYSICAL CONCEPTS • P. W. Bridgman. $2.75. 64 p. The Philosophical Library, Inc., 15 E. 40th St., New York, 1952.

PROCEEDINGS, 57TH ANNUAL CONVENTION, AMERICAN ASSOCIATION FOR HEALTH, PHYSICAL EDUCATION AND RECREATION, 1952 • $2. 127 p. American Association for Health, Physical Education and Recreation, 1201 16th St., N.W., Washington, D. C., 1952.

PROCEEDINGS OF THE TWENTY-NINTH ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF DENTAL SCHOOLS HELD AT COLORADO SPRINGS, COLO., MARCH 23-26, 1952 • 181 p. American Association of Dental Schools, Marion W. McCrea, Secy. Baltimore College of Dental Surgery, Dental School, University of Maryland, Baltimore, Maryland, 1952.

GATEWAY TO CITIZENSHIP • Carl B. Hyatt. Edited by Edwina Austin Avery. Issued 1943, revised 1948. 75c. 256 p. Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

HAGERSTOWN HEALTH STUDIES—AN ANNOTATED BIBLIOGRAPHY • Violet B. Turner, Public Health Service Publication No. 148. 20c. 38 p. Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., 1952.

ILLNESS AND HEALTH SERVICES IN AN AGING POPULATION • Four papers presented in Section IV of the Second International Gerontological Congress, St. Louis, Missouri, September 9-14, 1951. G. St. J. Perrott, Antonio Ciocco, George Baehr, Leonard S. Rosenfeld, and their collaborators. Public Health Service Publication No. 170. 25c. 68 p. Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., 1952.

BENJAMIN DISRAELI, EARL OF BEACONSFIELD • Cecil Roth. 178 p. $3.75. The Philosophical Library, Inc., 15 E. 40th St., New York, 1952.

DRUGS AND SOLUTIONS • Harold N. Wright, M.S., Ph.D., and Mildred Montag, Ed.D., R.N. 91 p. 17 illus. $1.75. W. B. Saunders Co., West Washington Square, Philadelphia, 1952.

PUBLIC HEALTH AND WELFARE IN JAPAN—FINAL SUMMARY, 1951-52, VOLUME 1 • General Headquarters, Supreme Commander for the Allied Powers, Medical Section, Public Health and Welfare Division. 136 p. Department of the Army, MS, PHW, HQ, FEC, APO 500, c/o P.M., San Francisco.

AMERICA'S HEALTH DIRCTORY • Henry Hatton. 96 p. $2.50. Public Affairs Press, 2153 Florida Ave., Washington, D. C., 1952.

Current Literature

THE PROBLEM OF IMPACTED TEETH IN ORTHODONTICS

Kenneth T. Adamson. Austral. J. Den. 56:74, April, 1952.

An impacted tooth "may be defined as one which is wedged between the jaw and another tooth or one which is firmly fixed in the jaw." Such teeth are frequently encountered during the treatment of orthodontic cases. Many are due to premature loss of deciduous teeth; others occur as the result of abnormal growth and developmental processes. It is with the latter group that this paper is concerned.

The least common condition is that which involves a deciduous mandibular second molar; it begins with the ankylosis of the tooth to the alveolar bone. Treatment must be of a preventive nature; the ankylosed molar should be noted and removed immediately. The removal of the tooth should be followed by the insertion of a simple space retainer to insure room for the succeeding tooth to erupt.

When a maxillary central incisor fails to erupt, it is usually because of: (1) the presence of one or more supernumerary teeth overlying the crown of the tooth, (2) injury or trauma in the early formative stages or (3) a thickening or fibrous condition of the gum tissue overlying the tooth. If a supernumerary tooth is present, it should be removed surgically if possible, although at times a single supernumerary tooth may be so deeply placed and so near the midline as to be in close approximation to the anterior palatine vessels and nerves. In such cases, there is a certain reluctance on the part of oral surgeons to undertake its removal; and it may be advisable to wait and see whether the supernumerary tooth will move to a more favorable position.

It is not uncommon to find maxillary first permanent molars impacted with the mesial marginal ridge jammed underneath the distal side of the second deciduous molar. For such a case the treatment is as follows: A maxillary impression is taken, and a model is cast. The deciduous second molar is then cut off the model. By careful observation it is possible to judge the position of the mesial surface of the partially erupted first molar. A space maintainer is made in the form of a small denture with stabilizing clasps, one of which is placed immediately in front of the partially erupted first molar to prevent its mesial movement but not its vertical eruption.

Mandibular second bicuspids sometimes fail to erupt normally even when there is sufficient space in the dental arches for them to do so. In one instance a mandibular second bicuspid was completely encased in a cyst. An oral surgeon cut open the region, exposed the tooth and removed as much of the cyst wall as possible. The eruption proceeded normally.

E. Bowdler Henry, honorary dental surgeon, Royal Dental Hospital, London, has made a summary of indications for the early removal of mandibular third molars.

There are a number of plans of treatment for maxillary cuspids, which are found to be impacted more frequently than any other teeth with the exception of the third molars. Eruption usually occurs spontaneously as a result of surgical exposure, the exception being those cases in which the tip of the tooth cannot be exposed because of its proximity to a neighboring tooth. Where direct traction is necessary, a simple type of force application may be employed. If a pin is set into the tooth, great care must be taken to avoid injuring the pulp.

C. R. Baker

PRESSURE HABITS, ETIOLOGICAL FACTORS IN MALOCCLUSION

Ernest T. Klein. Am. J. Orthodont. 38:569, August, 1952.

The etiology of malocclusion is infinitely complex; and, although abnormal pressure habits are a factor that must be considered in the study of the cause of malocclusion, they are by no means the complete answer to the orthodontist's problem.

Living bone is an ever-changing tissue that is being repaired and replaced constantly from infancy to old age; it is extremely susceptible to the guidance and influence of pressure and stimulus.

The extent to which living bone can be changed with pressure or stimulus is controversial; however, even the most conservative group will agree that alveolar bone can be changed and that the teeth in that bone can be regulated with orthodontic treatment, that is, with planned, intentional pressure.

Abnormal pressure habits, that is, unintentional pressure, also change alveolar bone

and regulate teeth in that bone because the bone-building cells on the receiving end of pressure or of stimulus cannot differentiate whether that pressure or stimulus in intentional or unintentional.

The face with its cartilaginous bone yields easily to stimulus and pressure especially during growth spurts and presents the most complicated growth problem in the entire skeleton. Since the greatest growth changes in the head are being made by the facial structures, it can be assumed logically that all abnormal pressures should be kept from this most vulnerable target, the face.

William F. Ford

PULP MANAGEMENT IN CHILDREN'S TEETH

Maurice E. Priestly. New Zealand D. J. 48:108, April, 1952.

Admittedly, the problem of pulp management is a cause of worry to many conscientious general practitioners. Because every practitioner cannot give the highly specialized treatments provided by the endodontists and the pedodontists, a sensible plan of treatment should be evolved which can be followed by the average conservative dentist so that more children's teeth can be saved. Subheadings under such a plan for the treatment of deciduous teeth are as follows: (1) simple exposure: pulp capping, pulpotomy and mummification; (2) necrotic molars: with sinus and without sinus; (3) deciduous anterior teeth: molars and bicuspids; anterior teeth in which the pulp has not been exposed and those in which traumatic exposure has occurred.

Such a plan of treatment can offer much help to the average general practitioner.

E. J. Fredrickson

THE ACTIVITIES THAT MARK AND MAKE A PROFESSION AND ACHIEVEMENTS THAT AID IT TO MEET THE DEMANDS OF THE DAY

George M. Anderson. Am. J. Orthodont. 38:588, August, 1952.

During the past five decades the orthodontic specialty service has been a most active and creditable factor in the betterment of human dentition and thus of the health and happiness of the individual. Orthodontic societies, literature, schools and individuals give no indication that they will rest on these laurels; yet no relaxation of effort should be condoned. Orthodontists must not compromise with principles nor follow blindly large-scale popular ideas which may have dangerous consequences. They must learn to demand proof of the soundness and worth of treatment measures. If they assume their responsibilities which have increased as the decades have passed, they will be a credit to the professional world and an indispensable part of the public's need and will justify their existence in the realm of health service. Theirs is not a sterile field; past progress has not exhausted their abilities; the years have simply proved their value. No excuses need to be offered for the extent or rate of their progress; with reasonable assurance they can feel that the second half century will repay them manyfold for the physical and mental investment of the first half. Nevertheless, they will progress more rapidly and with greater accomplishments if they control their presumption and even their optimism so that they do not misdirect otherwise intelligent effort.

William F. Ford

WHAT DOES EXTRAORAL ANCHORAGE ACCOMPLISH?

Beulah G. Nelson. Am. J. Orthodont. 38:422, June, 1952.

The problem of anchorage is a major concern of every thoughtful orthodontist. Early in his student life, he begins learning about the various types of anchorage: simple, reciprocal, stationary, intermaxillary and occipital. As he applies his knowledge, first in the clinic and later in his practice, he continues learning the lessons of anchorage that only experience can teach. Daily he observes the operation of that relentless law of physics: To every action there is an equal and opposite reaction. He learns from sad experience, as no written or spoken words can convey, that what is conceived and planned to be stationary anchorage sometimes proves disappointingly unstable, that even when all the teeth of one dental arch are combined securely as a unit of anchorage for intermaxillary force, they may move in an unfavorable direction as a result of pressures that are intended to move only the teeth of the opposite arch.

Extraoral anchorage is the only truly stationary anchorage. One cannot overemphasize the fact that no reliable unyielding anchorage can be established in the mouth.

Extraoral anchorage can be used as a means of increasing or decreasing arch length. Such a change can be accomplished without forward movement of the buccal teeth. As a means of changing mesiodistal relationships of upper to lower teeth, extraoral anchorage is

a valuable aid, either in its simplest form, delivering distal pressure intermittently on two molars, or attached to a fixed appliance. This use of it is advantageous when it is desirable to leave one dental arch completely undisturbed and to secure all the movement in the opposite arch. Extraoral anchorage is indispensable as reinforcement of intraoral anchorage when minimal movement of the anchor teeth is desired. As a form of retention, extraoral anchorage permits freely functional movement of teeth with intermittent restraint against tendencies to relapse.

Both laboratory experiments and clinical results have proved the advantages of light intermittent pressures in orthodontic treatment. Extraoral anchorage offers one of the most effective ways of applying gentle intermittent force to move teeth effectively with a minimum of pain to the patient and minimum damage to the tissues.

William F. Ford

THE ORAL SURGEON'S ROLE IN MANAGEMENT OF UNERUPTED TEETH

Claude S. LaDow. Am. J. Orthodont. 38:521, July, 1952.

According to one method of diagnosis and treatment of unerupted teeth, after the clinical examination and the roentgenographic findings the teeth are exposed sufficiently for orthodontic guidance. A surgical path of eruption is advocated to facilitate early orthodontic treatment. A special technic for the placement of a pin is recommended for palatally impacted cuspids. Important factors in this technic include the depth and direction of the slot in the tooth, the use of a heavy platinized gold pin and the maintenance of a sterile dry surface.

Conservative surgical management of unerupted teeth for future components of the dental arch is sufficiently successful to warrant its employment in all cases where there is no pathological condition.

William F. Ford

EXAMINING THE CHILD PATIENT

Kenneth A. Easlick. New Zealand D. J. 48:89, April, 1952.

In 1950, approximately a fourth of the United States population was 14 years old or younger. It has been estimated that each general practitioner in the United States should be devoting a fourth of his appointments to children and each dental student a fifth of his training. With the treatment for caries now available to the practitioner or, at least, to the research man, a great shift in emphasis in the dental practice is predicted. The shift will be away from replacement of adult teeth ruined by caries to a "programme for securing an optimally functioning young occlusion, and the maintaining the supporting tissues of unit teeth throughout life." Dental practice of the past will not be good enough for this new responsibility.

The procedures entailed in examining the child patient include: (1) exploration of the teeth, (2) determination of caries susceptibility, (3) the roentgenographic survey, (4) the occlusal survey and (5) the survey of the soft tissues.

A conscientious study based on these five points should provide enough scientific data for an effective treatment plan. With this type of planning the practice of dentistry for children becomes a highly satisfactory professional activity.

E. J. Fredrickson

PRACTICAL SUGGESTIONS ON CHILD MANAGEMENT

Stewart A. MacGregor. New Zealand D. J. 48:102, April, 1952.

The unsuccessful methods of child management resorted to in the past were a result of "more dentists who were afraid of children than there were children afraid of dentists." From a statistical examination of dental caries in children it is obvious that a more direct method for child management is needed, one that will be successful economically as well as from the child's point of view. Four main points to be considered are:

1. Office personnel. This point includes a listing of qualities the dentist himself must possess and a short résumé of the attributes of a good dental assistant.

2. Office environment. Important items include office furnishings and reading material.

3. The child. Child dental patients are either co-operative or, because of age and inability to understand or because of home training, non-co-operative. Solution of problems in this class requires great understanding of the child himself as well as of the problems concerning the child.

4. The parent. There are various types of parents encountered in the dental office, and the method of dealing with the parent varies with his type.

E. J. Fredrickson

OBJECTIVES AND LIMITATIONS OF ORTHODONTIC THERAPY

Lennard T. Swanson. New England J. Med. 246:1007, June 26, 1952.

It is generally agreed that about 50 per cent of the population show some irregularity in tooth alignment. The percentage of cases actually in need of treatment is smaller, depending on the criteria used in determining the need. Orthodontic literature, revealing disagreements on this subject, indicates that more complete methods are needed to deal with the problems involved.

Orthodontics is a recent specialty. Previous training emphasized the mechanical approach rather than the biological requirements to which thinking is now being directed. For practical purposes normal occlusion should be defined in terms of the needs of the individual. The arrangement of the teeth must be such that the life expectancy of the masticatory apparatus is not jeopardized, and the esthetics must be acceptable to the person. In the light of present-day dietary habits, masticatory inefficiency is not a severe handicap in the majority of malocclusions.

Fixed appliances are commonly used in this country for correction of malocclusion. Some are simple, some are complex; each has advantages and disadvantages.

A true evaluation of occlusion involves an assay of the masticatory apparatus in function. A better understanding through research is necessary to accomplish this aim. Dentofacial abnormalities are rarely the result of a single etiologic factor. The interaction of heredity, growth, development and environment leads to the many types of malocclusion now in evidence. End results should be planned on the basis of the whole facial complex rather than the occlusion only. No clinical methods are available for determining accurately the anatomic and physiologic requirements and limitations of the individual. Therefore, present treatment must be based on trial and error tempered by clinical experience.

From the orthodontic point of view, more importance is assigned to the early loss of deciduous molars than to the loss of incisors; and space maintenance is determined on this principle. The bulk of orthodontic treatment at present is performed after loss of the deciduous teeth. Usually this transition takes place between the ages of ten and twelve.

The cost of orthodontic treatment has placed this health service beyond the reach of most persons. The need and demand for service are far greater than can be met by the present number of orthodontists. Preventive measures can decrease the incidence and severity of malocclusions but cannot eliminate them completely. Improved diagnostic methods, effective appliance therapy, treatment in accordance with the needs of the case rather than with an impractical ideal, all tend to reduce both the length of treatment and the cost. Orthodontic service is becoming more widely available; this trend will continue.

Joseph F. Burket

NEW PROCEDURE IN BILATERAL RECONSTRUCTION OF CONDYLES

Arthur E. Smith and Marsh Robinson. Plast. & Reconstruct. Surg. 9:393, May, 1952.

The object of this paper is to present a preliminary report of a new surgical procedure in bilateral reconstruction of condyles utilizing iliac-bone grafts and creation of new joints by means of nonelectrolytic metal.

The scar tissue which forms in the region of the removed condyle undergoes contraction and tends to open the bite. This tissue contributes also to the limitation of motion. Posterior displacement of the mandible is to be expected after a condylectomy. The authors of this article are opposed not to the standard operation for the correction of prognathism but to bilateral condylectomy for this purpose because of the excessive mutilation that results.

A case which was treated by the new method of reconstruction was that of a soldier who, because of repeated injury to his condyles followed by repeated surgical interventions, had lost the substance of both condyles. Over a period of 5½ years this patient was admitted to four Army installations and five Veterans Administration hospitals. The jaws were wired eight times with 15 bilateral dislocations after removal of the wires. The left condyle was operated on twice, the right condyle once; after these operations both condyles were removed and the jaws were wired for one year. The jaws were wired for a total of 3¼ years.

In the first stage of the treatment of this case the right and the left sides were operated on separately. Grafts prepared from the iliac bone were fitted to the mandible and into the glenoid fossa in such a way as to replace the lost bone of the condyle. Approximately one year after the placement of the second graft, the right graft was surgically exposed; and a circular cut was made between the newly grafted ankylosed condyle and the ramus. A thin piece of nonelectrolytic metal was placed in the space and fastened to the ramus with the same material. About three months later

this operation was repeated on the left side. The intermaxillary wires were left in place a little over three months. The final result was that the patient had a normal intermaxillary relation, centric occlusion, a hinge-type masticatory function and a normal profile appearance.

Warren R. Schram

NEW HORIZONS IN CASE ANALYSIS—CLINICAL CEPHALOMETRICS

T. M. Graber. Am. J. Orthodont. 38:603, August, 1952.

Roentgenographic cephalometric analysis can give information on many aspects of orthodontics, including growth and developmental appraisal, abnormalities, general facial and skeletal type and functional analysis.

Cephalometric analysis is based on the differential attainment of the developmental pattern by the various components of the cranial and facial bony skeleton. In cephalometric analysis, malocclusions can be divided into three groups:

1. Skeletal dysplasia—malrelationship of the maxillary and mandibular bases with the teeth reflecting this malrelation but perhaps in fairly good position when compared to their basal bone only.

2. Dental dysplasia—good skeletal pattern with the malocclusion manifest in the tooth regions only.

3. Skeletodental dysplasia—combination of basal and local relationships.

Cephalometric analysis is not a panacea for all diagnostic troubles. There is no substitute for clinical experience and judgment, but cephalometric analysis can help a great deal.

William F. Ford

ORTHODONTIC "GROWING PAINS"

Andrew F. Jackson. Am. J. Orthodont. 38:485, July, 1952.

Every vital problem in life must, in all logic and common sense, be dealt with by the three methods of approach at man's command: the philosophical, the scientific and the artistic. All have their proper places in every problem in life, but the measure of success which may be hoped for depends on the degree of intelligent application with which each is employed.

In orthodontics, as in every other form of art, the first and most important essential for the beginner is to have teachers worthy of imitation, whose experience and demonstrated practical results are amenable to intelligent analysis and acceptance.

For the time being, the specialty of orthodontics is split into at least two irreconcilable camps whose methods and viewpoints follow almost exactly the diametrically opposite and conflicting patterns of communism and democracy. Angle was the inventor and the original dictator of the philosophy of the "edge-wise" appliance and of the methods employed in its dissemination. These same methods—youth indoctrination, cell infiltration (exclusive "Angle" study clubs) and satellite domination (Angle-dominated university orthodontic departments)—are being employed, if anything, in a more hidebound and highhanded manner by the leaders of this particular creed today and with plenty of followers.

If there is one thing in the world which tends to create bigotry, conceit and intolerance in orthodontics, it is the worship of some specific mechanical appliance, particularly when it is not adaptable—none of them are—to universal clinical application.

At all times during his practice, the author has tried to keep an open mind and to apply principles of universal application suitable to the treatment of the individual physical peculiarities of each case. As there is not a single appliance which is applicable to all cases, it is a categoric necessity for a practitioner to be familiar with a wide variety of appliances and to employ them in the order of their efficiency according to the transitional changes which always take place during the course of treatment of every patient.

William F. Ford

RECENT ADVANCES IN RESEARCH IN RELATION TO THE PREVENTION OF DENTAL CARIES

R. E. T. Hewat. New Zealand D. J. 48:112, April, 1952.

A scientific approach to the problems of dental caries must include the various theories of its causes as well as an analysis of the present methods and the studies that science is now undertaking to effect its cure. Current investigations cover such topics as diet, fluoridation of drinking water, heredity, detailed studies of war diets that effected certain changes in dental health, climatic conditions and a series of detailed studies concerning the tooth itself, its structure and its composition.

E. J. Fredrickson

Deaths

Abrams, R. Russell, New York; New York College of Dentistry, 1895; died September 6; aged 78.

Bacon, Lee A., Chicago; Dental School, Northwestern University, 1903; died October 29; aged 76.

Ball, Hugh T., Greer, S. C.; died September 6.

Beckman, Fritz S., Grundy Center, Iowa; College of Dentistry, University of Iowa, 1903; died October 20; aged 71.

Beinhart, Michael E., Cincinnati; Ohio College of Dental Surgery, University of Cincinnati, 1902; died August 6; aged 78.

Bell, Robert I., Greenfield, Ind.; Central College of Dentistry, Indianapolis, 1900; died September 22; aged 75.

Belsaw, Edward T., Mobile, Ala.; Dental Department, Meharry Medical College, Nashville, 1908; died September 16; aged 72.

Berger, Marcus A., Homestead, Fla.; Ohio College of Dental Surgery, University of Cincinnati, 1916; died August 15; aged 57.

Best, Thomas H., Orangeburg, S. C.; Dental Department, Meharry Medical College, Nashville, 1923; died June 17; aged 55.

Blaine, Luther L., Chicago; College of Dentistry, University of Illinois, 1916; died August 16; aged 64.

Blumenthal, Jacob, West Hartford, Conn.; Dental Department, Baltimore Medical College, 1910; died October 11; aged 69.

Boger, Charles F., Natchez, Miss.; School of Dentistry, Vanderbilt University, 1899; died August 9.

Borgendale, Edward, Dawson, Minn.; College of Dentistry, University of Minnesota, 1905; died August 16; aged 75.

Bower, Charles P., Flint, Mich.; College of Dental Surgery, University of Michigan, 1915; died in October.

Bradley, Ancel M., Muskogee, Okla.; Western Dental College, Kansas City, 1901; died July 2; aged 75.

Brattan, Vernon W., Austin, Texas; College of Dentistry, Baylor University, 1931; died October 16; aged 45.

Brusilowsky, Abraham, Brooklyn; New York College of Dentistry, 1914; died September 19; aged 74.

Buchel, Fred W., Cuero, Texas; Texas Dental College, Houston, 1911; died October 18; aged 63.

Bugbee, Coy M., Springfield, Vt.; Pennsylvania College of Dental Surgery, Philadelphia, 1900; died October 22; aged 77.

Byers, John F., St. Joseph, Mo.; Kansas City-Western Dental College, 1926; died in October; aged 51.

Carroll, William Z., Galveston, Texas; Dental School, Northwestern University, 1911; died September 4; aged 67.

Click, Eugene G., Elkin, N. C.; Baltimore College of Dental Surgery, 1907; died June 17; aged 68.

Coldiron, Harley S., Columbus, Kan.; Kansas City-Western Dental College, 1922; died November 5; aged 54.

Colfer, John A., Hastings, Neb.; College of Dentistry, Creighton University, 1908; died October 29; aged 68.

Colson, Walter L., Welch, W. Va.; College of Dentistry, Howard University, 1911; died August 6; aged 63.

Commander, Jacob, Philadelphia; Medico-Chirurgical College of Philadelphia, 1916; died October 10; aged 64.

Coolidge, Bruce N., Colony, Va.; School of Dental Medicine, Harvard University, 1930; died October 27; aged 51.

Cooper, Harry F., Centre Hall, Pa.; School of Dentistry, University of Pittsburgh, 1931; died June 9; aged 45.

Corr, Thomas F., Nicholson, Pa.; School of Dentistry, University of Pittsburgh, 1911; died October 27; aged 77.

Crowley, William J., Ardmore, Pa.; School of Dentistry, University of Pennsylvania, 1910; died September 19.

Danreiter, Charles P., Sterling, Ill.; Chicago College of Dental Surgery, Loyola University, 1933; died September 22; aged 46.

Davis, Harry L., Chicora, Pa.; School of Dentistry, University of Pennsylvania, 1907; died October 29.

Dedic, Frank J., Chicago; Chicago College of Dental Surgery, Loyola University, 1915; died July 11, aged 58.

Denhart, George E., Laguna Beach, Calif.; College of Dentistry, University of Southern California, 1925; died June 30; aged 56.

Detmer, Charles E., Washington, D. C.; Dental Department, George Washington University, 1907; died September 21; aged 76.

Doolittle, George P., Albion, N. Y.; Dental School, Northwestern University, 1895; died October 27; aged 85.

Ellington, William G., Cooper, Texas; Louisville College of Dentistry of Centre College, 1904; died April 4; aged 82.

Elliott, William P., Camden, Ark.; St. Louis Dental College, 1903; died September 29; aged 81.

Essig, Norman S., Philadelphia; School of Dentistry, University of Pennsylvania, 1889; died July 2; aged 82.

Evans, Lawrence B., Tallahassee, Fla.; Atlanta-Southern Dental College, 1924; died October 25; aged 53.

Faass, Elton V., Tucson, Ariz.; Dental School, Harvard University, 1923; died August 6.

Feinberg, Cecelia, New York; School of Dentistry, Temple University, 1900; died October 21; aged 81.

Kobert, Arthur A., Whitmore Lake, Mich.; College of Dental Surgery, University of Michigan, 1952; died September 1; aged 29.

Melcher, Erwin R., Chicago; College of Dentistry, University of Illinois, 1937; died October 10.

Merchant, Irving, Jamaica, N. Y.; College of Dentistry, New York University, 1943; died August 8; aged 32.

Millberry, Guy S., Los Gatos, Calif.; College of Dentistry, University of California, 1901; died September 30; aged 79.

Miller, Ed A., Hopkins, Mo.; Kansas City Dental College, 1898; died June 14; aged 78.

Miller, Edward F., Milwaukee; Dental School, Marquette University, 1919; died September 12; aged 55.

Mills, George W., Springfield, Ill.; Chicago College of Dental Surgery, Loyola University, 1912; died June 25; aged 64.

Milnes, Benjamin B., Buffalo; School of Dentistry, University of Buffalo, 1916; died August 30; aged 59.

Morford, LeRoy C., Portland, Ore.; School of Dentistry, North Pacific College of Oregon, 1925; died September 2; aged 55.

Murnen, Owen F., Ogdensburg, N. Y.; Faculty of Dentistry, McGill University of Montreal, 1933; died July 1; aged 48.

Myers, Marion E., Louisville, Ohio; Ohio College of Dental Surgery, University of Cincinnati, 1898; died September 7; aged 80.

Nakadate, Michio M., Los Angeles; College of Dentistry, University of Southern California, 1932; died August 11; aged 43.

Naudack, Robert W., Monte Vista, Colo.; School of Dentistry, University of Denver, 1929; died July 20; aged 45.

Neales, Stanley C., Lawrence, Mass.; Boston Dental College, 1896; died August 26; aged 79.

Needy, Elwood K., St. Louis; School of Dentistry, St. Louis University, 1927; died September 7.

Nelgner, Harry D., St. Louis; School of Dentistry, St. Louis University, 1913; died July 7; aged 61.

Packard, Nephi H., Ogden, Utah; died July 25; aged 88.

Packard, Reuel N., Idaho Falls, Idaho; died August 17.

Parrilli, George W., Chicago; Chicago College of Dental Surgery, Loyola University, 1932; died August 30; aged 45.

Paxman, Edgar A., Provo, Utah; Chicago College of Dental Surgery, Loyola University, 1917; died July 15.

Peirce, Eugene B., Denver; Kansas City Dental College, 1900; died July 17; aged 76.

Perry, Roy A., Naches, Wash.; School of Dentistry, North Pacific College of Oregon, 1926; died September 28; aged 51.

Peterson, James F., Beverly Hills, Calif.; Indiana Dental College, 1901; died in July.

Piper, James L., Northwood Ridge, N. H.; Baltimore College of Dental Surgery, 1900; died September 26; aged 80.

Pittwood, Edward E., Spokane, Wash.; Ohio College of Dental Surgery, University of Cincinnati, 1881; died September 15.

Poindexter, William, Laverne, Okla.; College of Dentistry, Baylor University, 1945; died June 26; aged 33.

Pool, Jesse W., Norcatur, Kan.; Kansas City-Western Dental College, 1923; died May 7; aged 54.

Porter, Helen K., Los Angeles; died August 19.

Poston, Leon L., Davenport, Iowa; College of Dentistry, University of Iowa, 1896; died July 4; aged 81.

Potts, Frank S., Green Bay, Wis.; Dental School, Northwestern University, 1899; died May 9; aged 75.

Purcell, William M., Streator, Ill.; Dental School, Northwestern University, 1901; died August 6; aged 73.

Ralstin, Henry W., Wichita, Kan.; Dental School, Northwestern University, 1918; died May 14; aged 63.

Raynaud, Herbert F., San Francisco; College of Physicians and Surgeons, San Francisco, 1917; died September 13; aged 63.

Reaben, Walter H., McComb, Miss.; died July 6; aged 79.

Restin, Bruno O., New York; College of Dental and Oral Surgery, New York, 1917; died September 5; aged 58.

Riggs, Orville H., New York; died March 7; aged 51.

Ritter, Frank G., Philadelphia; Pennsylvania College of Dental Surgery, 1902; died September 28; aged 75.

Robbins, Horace M., Malden, Mass.; Dental School, Tufts College, 1898; died August 22.

Roberts, Clarence W., Emporia, Kan.; Kansas City Dental College, 1913; died September 22.

Robertson, Frederick P., Memphis, Tenn.; Philadelphia Dental College, 1904; died July 1; aged 75.

Rosenthal, Louis, Coral Gables, Fla.; died February 8.

Ross, Thomas K., Fitchburg, Mass.; Dental School, Harvard University, 1895; died September 13; aged 78.

Rossman, Carl A., Seattle; School of Dentistry, North Pacific College of Oregon, 1924; died in July; aged 56.

Rowe, Kenneth W., Creston, Iowa; College of Dentistry, University of Iowa, 1923; died September 13; aged 52.

Ryan, John W., Peabody, Mass.; Dental School, Tufts College, 1932; died July 14; aged 43.

Sams, Barney, Jersey City; College of Dental and Oral Surgery, New York, 1921; died August 25; aged 54.

Sanders, Harry P., Seattle; Louisville College of Dentistry of Centre College, 1909; died in June; aged 75.

Schacht, Joseph, Wadena, Minn.; College of Dentistry, University of Minnesota, 1904; died August 31; aged 70.

Seale, Walter B., Marquez, Texas; School of Dentistry, Tulane University, 1915; died May 31; aged 60.

Serijan, Raphael M., Middleville, Mich.; College of Dental Surgery, University of Michigan, 1915; died September 2; aged 71.

Shaffer, Herbert P. D., Mount Vernon, Ohio; Indiana Dental College, 1900; died July 16; aged 77.

Shaffer, Paul H., Aurora, Ill.; Dental School, Northwestern University, 1938; died July 6; aged 36.

Sharpe, Merton R., Uxbridge, Mass.; Boston Dental College, 1899; died July 3; aged 78.

Silverman, Samuel P., Worcester, Mass.; Dental School, Tufts College, 1923; died August 7; aged 52.

Smart, James G., Shreveport, La.; School of Dentistry, Loyola University, New Orleans, 1932; died August 28; aged 44.

Waddell, James C., East St. Louis, Ill.; Dental School, Northwestern University, 1903; died July 12; aged 72.

Walstrom, George R., Seattle; College of Dentistry, University of Minnesota, 1915; died July 12; aged 60.

Waters, Thomas M., Pittsburgh; School of Dentistry, University of Pittsburgh, 1926; died August 29; aged 54.

Watkins, Kindred M., Orange, Texas; died September 6.

Webster, George H., Wilmette, Ill.; died June 7; aged 74.

Welch, Ralph E., Sabetha, Kan.; Kansas City Dental College, 1909; died July 2; aged 68.

Werntz, Edward S., Gillette, Wyo.; Chicago College of Dental Surgery, Loyola University, 1909; died August 3; aged 73.

West, Carl H., San Fernando, Calif.; College of Dentistry, Creighton University, 1909; died June 16; aged 64.

Westerkamp, Frank W., Cincinnati; Cincinnati College of Dental Surgery, 1923; died July 18; aged 61.

White, William D., Roxbury, N. Y.; School of Dentistry, University of Pennsylvania, 1902; died August 20; aged 74.

Wight, Holland E., Yakima, Wash.; Dental School, Northwestern University, 1905; died August 29; aged 69.

Wilkes, Augustus M., Lansing, Mich.; Kansas City Dental College, 1894; died July 23; aged 82.

Williams, Oscar, Shickshinny, Pa.; School of Dentistry, University of Pennsylvania, 1919; died August 16; aged 55.

Willis, William E., Princeton, Ky.; College of Dentistry, University of Tennessee, 1940; died May 25; aged 43.

Wilson, Fred T., Sheridan, Ind.; Indiana Dental College, 1912; died September 1; aged 67.

Wingrave, Thomas J., New Orleans; School of Dentistry, Tulane University, 1907; died August 17.

Winsmore, Harry D., Ridley Park, Pa.; School of Dentistry, University of Pennsylvania, 1902; died August 10; aged 69.

Wittner, Henry L., New York; died July 27.

Wolfgang, Milton M., Scranton, Pa.; School of Dentistry, Temple University, 1926; died July 7; aged 48.

Wolfson, Abraham, Newark, N. J.; Department of Dentistry, College of New Jersey, 1917; died July 18; aged 58

Woodbury, Charles E., Alhambra, Calif; Boston Dental College, 1887; died September 12; aged 87.

Woodward, Paul J., Indianola, Miss.; School of Dentistry, Tulane University, 1912; died September 12; aged 65.

Young, Arthur S., Galva, Ill.; died June 5.

Young, Jerry W., Chicago; Dental School, Northwestern University, 1915; died October 7; aged 72.

Young, William B., Beaver Falls, Pa.; School of Dentistry, University of Pittsburgh, 1928; died in July; aged 48.

Zederbaum, George, Lansing, Mich.; Dental School, Northwestern University, 1902; died July 15; aged 77.

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Announcements

MEETINGS OF THE AMERICAN DENTAL ASSOCIATION

Ninety-Fourth Annual Session	Sept. 28-Oct. 1, 1953	Cleveland
Ninety-Fifth Annual Session	Nov. 8-11, 1954	Miami
Ninety-Sixth Annual Session	Oct. 17-20, 1955	San Francisco

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	Apr. 9-11	Montgomery	F. A. Finney, Jr.	1045 Forrest Ave., Gadsden
Alaska	July 22-25	Juneau	J. D. Smith	Box 134, Juneau
Arizona	Apr. 23-25	Tucson	E. M. Scott	17 E. Weldon Ave., Phoenix
Arkansas	Apr. 5-8	Little Rock	D. M. Hamm	White Bldg., Clarksville
California	Apr. 13-15	San Francisco	L. R. Ludwigsen	450 Sutter St., San Francisco
S. California	Apr. 20-22	Los Angeles	C. A. Moss	903 Crenshaw Blvd., Los Angeles
Colorado	Oct. 4-7	Colorado Springs	W. R. Humphrey	724 Republic Bldg., Denver
Connecticut	May 20-23	Hartford	E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware	Jan. 14	Wilmington	J. J. Ficca	2130 Lancaster Ave., Wilmington
District of Columbia	Mar. 15-18	Washington	K. H. Wood	202-1835 Eye St., N. W., Washington
Florida	Apr. 19-22	St. Petersburg	C. T. Brown	602 Citizens Bldg., Tampa 2
Georgia	Oct. 18-21	Atlanta	J. W. Yarbrough	Bibb Bldg., Macon
Hawaii	June 24-27	Honolulu	J. H. Dawe	810 N. Vineyard St., Honolulu 17
Idaho	June 18	Sun Valley	J. F. Julian	206 Rogers Bldg., Idaho Falls
Illinois	May 11-14	Peoria	P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana	May 18-20	Indianapolis	E. E. Ewbank	Kingman
Iowa	May 4-6	Des Moines	H. I. Wilson	639 Insurance Exchange Bldg., Des Moines
Kansas	May 10-13	Kansas City, Mo.	F. A. Richmond	861 Brotherhood Bldg., Kansas City
Kentucky	Apr. 7-9	Louisville	A. B. Coxwell	1976 Douglass Blvd., Louisville
Louisiana	Apr. 29-May 2	New Orleans	J. S. Bernhard	2515 Line Ave., Shreveport
Maine	June 25-27	Rockland	S. M. Gower	Box 27, Skowhegan
Maryland			E. L. Pessagno, Jr.	19 Medical Arts Bldg., Baltimore 1
Massachusetts	May 3-6	Boston	H. E. Tingley	12 Bay State Road, Boston
Michigan	Apr. 20-23	Detroit	F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota	Feb. 23-25	Minneapolis	C. V. E. Cassel	242 Lowry Medical Arts Bldg., St. Paul
Mississippi	Apr. 26-29	Jackson	H. M. Campbell	102 Professional Bldg., Tupelo
Missouri	May 10-13	Kansas City	R. R. Rhoades	201 Merchants Bank Bldg., Jefferson City
Montana	May 7-9	Missoula	C. S. Renouard	304 Phoenix Bldg., Butte
Nebraska	May 11-13	Lincoln	F. A. Pierson	1112 Federal Securities Bldg., Lincoln
Nevada	May 4, 5	Las Vegas	J. E. Ahlstrom	1150 Arizona, Boulder City
New Hampshire	June 11-14	Bretton Woods	F. E. Williams	814 Elm St., Manchester
New Jersey	Apr. 22-24	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico	May 24-27	Albuquerque	J. S. Ellar	Suite 7, Medical Arts Square, Albuquerque
New York	May 12-15	New York	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 17-20	Pinehurst	B. N. Walker	608 Liberty Life Bldg., Charlotte
North Dakota	May 24-27	Fargo	J. H. Lunday	302 Black Bldg., Fargo
Ohio	Nov. 8-11	Columbus	E. G. Jones	185 E. State St., Columbus
Oklahoma	Apr. 19-22	Tulsa	D. Robertson	434 N. W. 13th St., Oklahoma City
Oregon	Mar. 2-4	Portland	H. C. Fixott, Jr.	Medical Dental Bldg., Portland
Panama Canal Zone			F. D. Buckley	Box 293, Rodman
Pennsylvania	May 20-22	Atlantic City, N.J.	M. D. Zimmerman	217 State St., Harrisburg
Puerto Rico	Jan. 23-25	San Juan	A. Quiñones	San German
Rhode Island	Jan. 18-21	Providence	E. L. Bessette	1745 Broad St., Cranston 5
South Carolina	June	Greenville	J. R. Owings	7 Medical Court, Greenville
South Dakota	May	Rapid City	E. W. Elmen	Sioux Falls
Tennessee	May 11-14	Knoxville	W. L. McCulley	Brown Bldg., Cleveland
Texas	May 10-14	Houston	W. Ogle	3607 Gaston Ave., Dallas
Utah	Apr. 27-29	Salt Lake City	K. L. Dedekind	914 Medical Arts Bldg., Salt Lake City
Vermont	May 17-19	Woodstock	W. J. Reardon	Rutland
Virginia	May 4-6	Roanoke	J. E. John	804 Medical Arts Bldg., Roanoke

Washington	June 18-20	Yakima	F. J. Dingler	1502 Medical Dental Bldg., Seattle
West Virginia	July 19-22	White Sulphur Springs	A. B. Drake	506 West Virginia Bldg., Huntington 1
Wisconsin	Apr. 6-9	Milwaukee	R. A. Mason	964 N. 27th St., Milwaukee
Wyoming		Casper	T. J. Drew	State Office Bldg., Cheyenne

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Alabama	June 14*	Birmingham	N. E. Allen	Du Bose Bldg., Selma
Alaska	July 6-11	Fairbanks	J. H. Geyer	209 Goldstein Bldg., Juneau
Arizona			R. K. Trueblood	25 N. Second Ave., Glendale
Arkansas	June 22-26	Little Rock	H. O. Weatherly	205 Halter Bldg., Conway
California	Feb. 2	San Francisco	K. I. Nesbitt	507 Polk St., San Francisco 2
	June 22	Los Angeles		
Colorado	June 22-26	Denver	C. K. Phillips	724 Republic Bldg., Denver 2
Connecticut			C. G. Brooks	302 State St., New London
Delaware			P. K. Musselman	143 W. Main St., Newark
District of Columbia	Jan. 5-9	Washington	W. T. Birthright	1835 Eye St., N. W., Washington 6
Florida	July 6-14*	Jacksonville	A. W. Kellner	P. O. Box 155, Hollywood
Georgia			S. H. Yarbrough	Medical Arts Bldg., Columbus
Hawaii			H. L. Houvener	427 Dillingham Bldg., Honolulu
Idaho			W. K. Adams	1624 Arlington, Caldwell
Illinois			W. A. McKee	503 Wood Bldg., Benton
Indiana			C. A. Frech	504 Broadway, Gary
Iowa	May 25-29*	Iowa City	H. M. Willits	719 Roshek Bldg., Dubuque
Kansas			G. L. Teall	Box 71, Hiawatha
Kentucky	June 8-11	Louisville	R. I. Todd	Western Union Bldg., Richmond
Louisiana			A. R. de Nux	Marksville
Maine			R. A. Derbyshire	Box 387, Skowhegan
Maryland			H. Levin	3429 Park Heights Ave., Baltimore 15
Massachusetts			R. A. Barrette	Rm. 33 State House, Boston
Michigan	Jan. 26-30	Ann Arbor	J. L. Champagne	3714 W. McNichols Road, Detroit 21
	June 8-12			
Minnesota			F. A. Larson	1632 Washington St., N. E., Minneapolis
Mississippi	Jan. 5-7	Jackson	J. C. Boswell	508 Lamar Life Bldg., Jackson
	June 16-18			
Missouri			R. R. Rhoades	414 Central Trust Bldg., Jefferson City
Montana			V. J. Quinn	Box 865, Helena
Nebraska			H. E. Weber	1210 Federal Securities Bldg., Lincoln
Nevada			G. C. Steinmiller	Suite 6, Masonic Temple, P. O. Box 2473, Reno
New Hampshire			D. J. Freese	4 Wall St., Concord
New Jersey	June 1, 2**†††‡	Philadelphia	W. A. Wilson	150 E. State St., Trenton 8
	June 10, 11**	New York		
	June 3-5§	Trenton		
New Mexico	May 24-27	Albuquerque	J. J. Clarke, Sr.	Artesia
New York			D. W. Beier	23 S. Pearl St., Albany 7
North Carolina	June 22-25	Chapel Hill	F. O. Alford	1109 Liberty Life Bldg., Charlotte 2
North Dakota	July 13-17	Fargo	A. B. Crabtree	Ellendale
Ohio			H. B. Smith	322 E. State St., Columbus
Oklahoma			J. B. Cole	706 Asp St., Norman
Oregon			F. L. Utter	506 Pioneer Trust Bldg., Salem
Pennsylvania			A. M. Stinson	Dept. of Public Instruction, Box 911, Harrisburg
Puerto Rico			L. C. Coll	Box 9156, Santurce
Rhode Island			F. M. Hackett	267 Academy Ave., Providence
South Carolina			T. C. Sparks	1315 Pickens St., Columbia
South Dakota			O. Isaak	Tyndall
Tennessee			F. S. Maxey	804 Bennie Dillon Bldg., Nashville 3
Texas			R. T. Weber	312 Capital National Bank Bldg., Austin
Utah			M. W. Merrill	820 N. University Ave., Provo
Vermont			F. A. Reid	Windsor
Virginia	June 8, 9†‡	Richmond	J. M. Hughes	715 Medical Arts Bldg., Richmond 19
	June 8-12†			
Washington	Jan. 12	Seattle	J. B. Keifer, Jr.	510 Cobb Bldg., Seattle
West Virginia	June 22-24*	West Liberty	C. A. Laughlin	613 Prunty Bldg., Clarksburg
Wisconsin	Jan. 12-16*	Milwaukee	S. F. Donovan	Tomah
Wyoming			W. A. Hocker	212 O & S Bldg., Casper

*Dentistry and dental hygiene.
**Dental clinical examinations.
†Dental examinations.
†††Hygiene clinical examinations.
§Dental written examinations.
‡‡Hygienists' examinations.
‡Hygiene written examinations.

MEETINGS OF OTHER ORGANIZATIONS

Name	Date	Place	Secy. or Chm.	Address
Academy of Denture Prosthetics	Apr. 12-19	Los Angeles	I. L. Furnas Secy.	928 Silverado St., La Jolla, Calif.
American Academy of Implant Dentures	Feb. 7	Chicago	P. S. Loechler Secy.	215 Tenth St., S. E., Rochester, Minn.
American Academy of Oral Pathology	Feb. 8	Chicago	J. L. Bernier Secy.	Armed Forces Institute of Pathology, Washington, D.C.
American Academy of Restorative Dentistry	Feb. 7, 8	Chicago	A. G. James Secy.	409 N. Camden Drive, Beverly Hills, Calif.
American Association of Dental Schools	Mar. 24-25	Philadelphia	M. W. McCrea Secy.	Baltimore College of Dental Surgery, Dental School, University of Maryland, Baltimore 1
American Association of Endodontists	Feb. 7, 8	Chicago	V. B. Milas Secy.	2559 W. 63rd St., Chicago 29
American Association of Orthodontists	Apr. 26-30	Dallas, Texas	F. A. Squires Secy.	Medical Centre, White Plains, N. Y.
American Board of Orthodontics	Apr. 22-26	Dallas, Texas	C. E. Martinek Secy.	661 Fisher Bldg., Detroit 2
American Board of Prosthodontics	Feb. 1-7	Indianapolis	I. R. Hardy Secy.	Tufts College Dental School, 136 Harrison Ave., Boston 11
American Dental Society of Europe	Aug. 4-7	Bergen, Norway	F. D. Derrick Hon. Secy.	140, Park Lane, London W.1, England
American Denture Society	Feb. 7, 8	Chicago	A. L. Roberts Secy.	Aurora National Bank Bldg., Aurora, Ill.
American Society for the Advancement of General Anesthesia in Dentistry	Mar. 23	New York	M. H. Feldman Exec. Secy.	730 Fifth Ave., New York
Arpa Internationale, Thirteenth Congress	July 13-19	Geneva, Switzerland	J. N. Nally Secy. Gen., Com. on Organization	8, rue de Saussure, Geneva, Switzerland
Berkshire Conference in Periodontology and Oral Pathology	June 14-18	Boston	I. Glickman Dir.	Tufts College Dental School, 136 Harrison Ave., Boston 11
Chicago Dental Society	Feb. 8-11	Chicago	K. S. Richardson Exec. Secy.	30 N. Michigan Ave. Chicago 2
Cincinnati Dental Society	Mar. 22-24	Cincinnati	P. H. McMullen Exec. Secy.	123 E. Sixth St., Cincinnati 2
Council on Dental Education, Dental Aptitude Tests	Mar. 6, 7		S. Peterson Secy.	222 E. Superior St., Chicago 11
Dallas Mid-Winter Dental Clinic	Jan. 25-28	Dallas, Texas	W. C. McCaskill, Jr., Gen. Chm.	1329 Medical Arts Bldg., Dallas, Texas
Denver Dental Association	Jan. 11-14	Denver	H. L. Harris Secy.	724 Republic Bldg., Denver 2
Fédération Dentaire Internationale	July 26-Aug. 1	Oslo, Norway	G. H. Leatherman Hon. Secy.	35 Devonshire Place, London W.1, England
Greater Philadelphia	Feb. 4-6	Philadelphia	R. Adams Secy.	Bellevue-Stratford Hotel, Suite 337, Broad and Walnut Sts., Philadelphia 2
International Association for Dental Research	Mar. 20-22	Philadelphia	E. H. Hatton Secy.	311 E. Chicago Ave., Chicago 11
National Board of Dental Examiners	Feb. 10, 11		S. Peterson Secy.	222 E. Superior St., Chicago 11
New England Dental Society	Oct. 21, 22	Boston	F. L. Finley, Jr. Secy.	43 Farmington Ave., Hartford, Conn.
Northeastern Society of Orthodontists	Mar. 9, 10	New York	O. Jacobson Secy.	35 W. 81st St., New York
Seattle District Dental Society	Feb. 14	Seattle	R. J. Wallace Secy.	715 General Insurance Bldg., Seattle 5
Southeastern Society of Oral Surgeons	Mar. 6, 7	Birmingham, Ala.	C. F. Landeis Secy.	316 James Bldg., Chattanooga, Tenn.
Southern Academy of Oral Surgery	Mar. 21, 22	Atlanta, Ga.	R. F. Sullivan Secy.	118 E. Jones St., Savannah, Ga.

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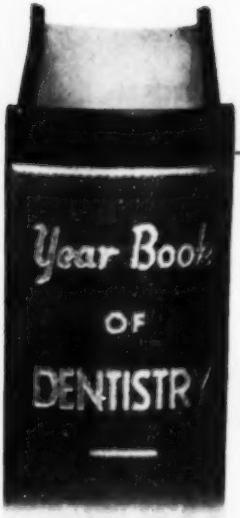

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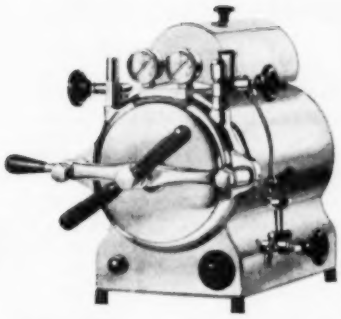

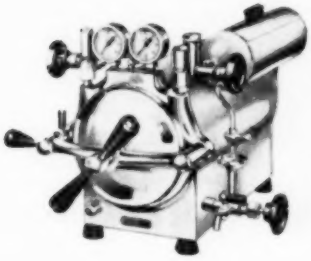

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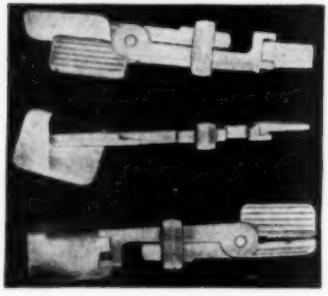

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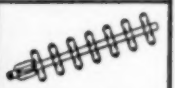

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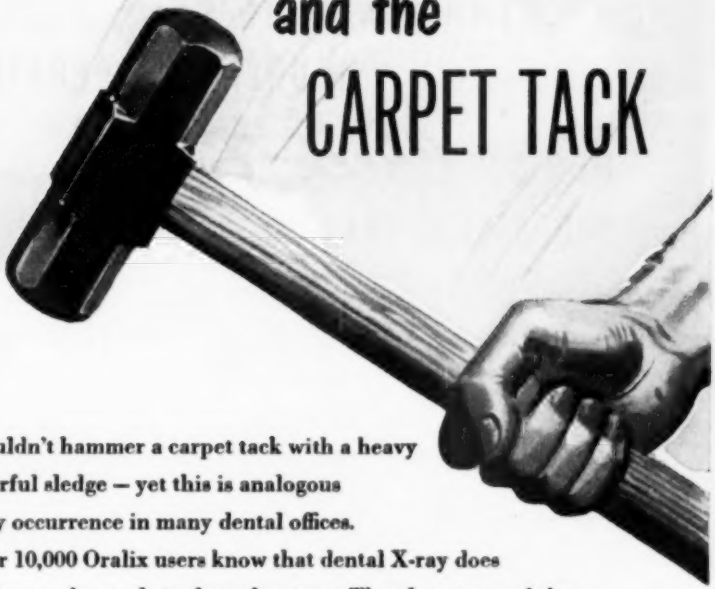

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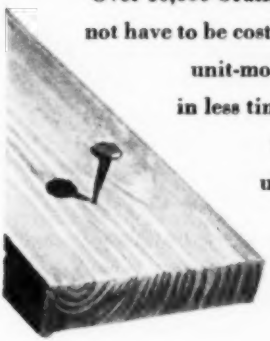

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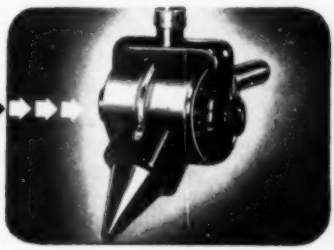

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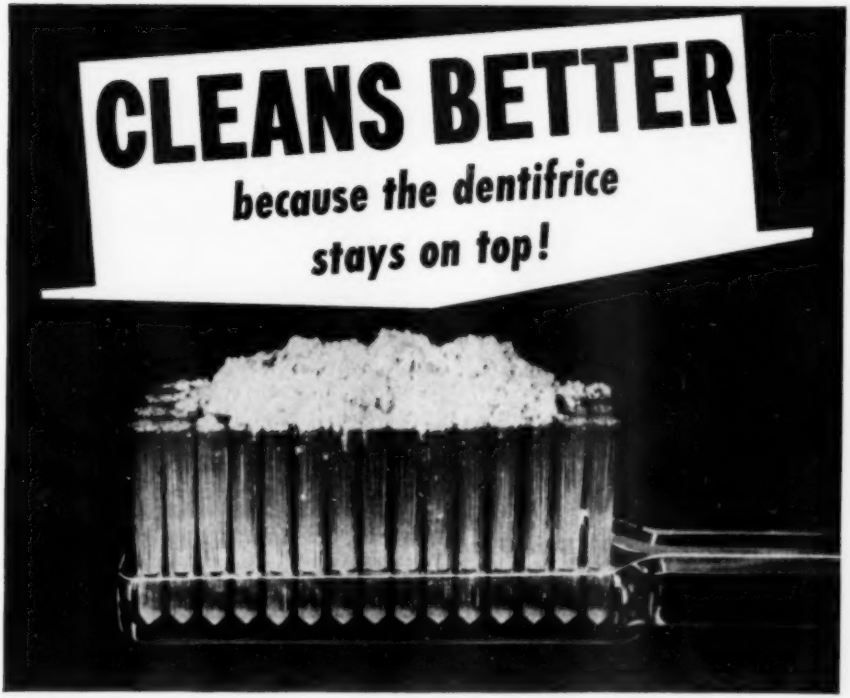

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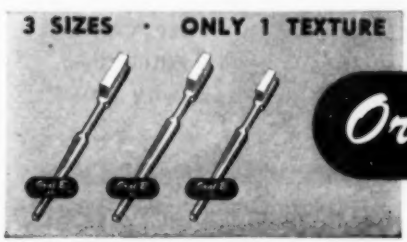

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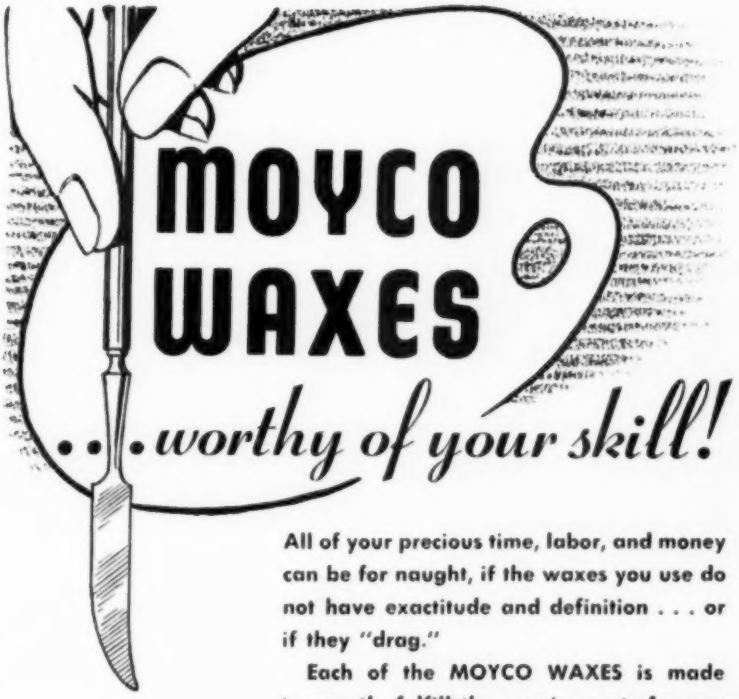

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•

IDAHO—Dentist badly needed in County seat, population 3,000. 10,000 population drawing area. Stable community of farming, stock raising, mining, lumbering. Excellent hunting, fishing, recreation. Direct replies to Dr. H. L. Olson, Chamber of Commerce, Grangeville, Idaho.

•

MARYLAND—Resident in Oral Surgery and Dental Intern wanted beginning July 1, 1953. Applicants for residency must have postgraduate or previous hospital training. Recent graduate accepted for internship. Applicants must be graduates of accredited dental schools. Training in all surgical and related subjects. Approved by A.D.A. Direct replies to Executive Director, Sinai Hospital, Baltimore 5, Md.

MASSACHUSETTS—Associate wanted for well-established general practitioner in eastern Massachusetts. Must be free from military service, about 3-5 years' experience, good exodontist preferred. Excellent opportunity for right man. Give full details as to professional background and state registration. Address A.D.A. Box No. 177.

•

MASSACHUSETTS—Associate wanted for busy Boston practice. Consider lease or rental basis also. New equipment, Airdent, two offices, 4 chairs. Senior member of father-son partnership now retiring makes possible this unique opening. Replies confidential. Address A.D.A. Box No. 178.

•

MICHIGAN—Dentist; draft exempt and under 40 years of age, for public health work in Michigan. Starting salary rate $4,500 per year. Michigan license not required provided the individual is a graduate of an accredited United States dental school and is licensed in another state. Direct inquiries to Child Health Division, Children's Fund of Michigan, 660 Frederick St., Detroit 2.

•

MICHIGAN—Dental hygienist; Michigan licensed, for public health work in Michigan. Starting salary rate $3,600 per year. Direct inquiries to Child Health Division, Children's Fund of Michigan, 660 Frederick St., Detroit 2.

•

NEBRASKA—Wanted: Dentist with Nebraska license to take over my established general practice while I'm in the service for about 18 months. Direct replies to Dr. R. J. Prendergast, Arnold, Neb.

•

NEW YORK—Wanted: Associate for large dental practice, mid New York State. Please give qualifications, age, and remuneration expected in first answer. Address A.D.A. Box No. 179.

•

NEW YORK—Associate wanted for general practitioner, located on Long Island. Excellent opportunity for eventual full partnership. Give complete details of training, professional experience and military status. Address A.D.A. Box No. 180.

LOCATIONS AVAILABLE

ILLINOIS—For Rent. Dental office in association with an established internist and E.E.N.T. man, South Side of Chicago. High class clientele. A referred dental practice would be assured. Answers must give complete background. Rental, including phone, utilities, etc., reasonable. Address A.D.A. Box No. 181.

•

ILLINOIS—Rent or lease. Dental suite Joliet downtown; excellent corner location. One year old equipment also available, if desired. Direct replies to Miss Brophy, 8126 Ellis, Chicago.

•

NEW YORK—Hempstead, L. I. Excellent established dental location in heart of village. Modern two-chair suite, completely air conditioned. Long lease. Direct replies to Dr. J. E. Bloom, 50 Main St., Hempstead, L. I., N. Y. Phone Hempstead 2-2870.

•

NEW YORK—Syracuse. Established dental office with common waiting room with general practitioner. Good location. Direct replies to Dr. H. J. Sliski, 1040 W. Genesee St., Syracuse 4, N. Y.

OPPORTUNITIES WANTED

WANTED—To purchase. Active dental practice, long established and grossing over $15,000—from dentist contemplating retirement. Price is secondary—Connecticut, Westchester or Long Island. Address A.D.A. Box No. 182.

•

WANTED—Capable young dentist desires association or partnership with other ethical practitioner. Will consider buying good practice. Five years' experience general practice; three in own office, two in Air Force. Especially capable with children; can also handle minor oral surgery. Licensed Virginia and New York. Available February 1. Draft exempt. Address A.D.A. Box No. 183.

WANTED—Dentist, seven years' experience, married, age 33, graduate of accredited school. Two years of postgraduate courses, University of Pennsylvania, one year Forsyth Dental Infirmary for Children. Much experience operative dentistry, oral surgery, children's dentistry, crown and bridge. Wishes to contact institution, clinic, school, public health work, etc. Address A.D.A. Box No. 150.

•

WANTED—German dental technician, 29, single, complete training in orthodontic work and in the processing of precious metals and plastics including all acrylics, requests contact with a dentist in the U. S. A. with later immigration as objective. Good credentials and references offered. Direct replies to Horst Kuester, Essen-Stadtwald/Ruhr, Germany, Angerstrasse 17.

•

WANTED—Orthodontist, taking full-time postgraduate orthodontic course leading to M. Sc. (Dent.) to be completed in March. Interested in association or position leading to purchase of orthodontic practice in New York. Address A.D.A. Box No. 166.

•

WANTED—German dentist, 42, 25 years' experience, seeks post as a technician with dentist or in a laboratory. Address replies to K. Schulz, Blomberg/Lippe, Burgstr. 1a, Germany.

•

WANTED—1947 Northwestern graduate returning from 24 months' Air Force duty February 1953. Interested in Illinois association; buy practice, or rent good location. Address A.D.A. Box No. 184.

•

WANTED—Would like to associate with idea of purchasing practice in 1 or 2 years. Located in large industrial city in central New York. Write P. O. Box 540, Syracuse, N. Y.

WANTED—Dentist returning from service, available immediately. Desires location, practice, or association with option to purchase. New York license. Five years' experience. Long Island or Westchester preferred. Address A.D.A. Box No. 185.

•

WANTED—Dentist, age 36, single, 3 years' Army and V.A., 2 years' pedodontics, 16 months' graduate training in orthodontics; desires position as orthodontist with salary and/or commission. Available immediately. Missouri licensure. Address A.D.A. Box No. 186.

•

WANTED—Dentist, 1950 graduate; veteran World War II; M.S. Degree in Oral Surgery; 16 months' hospital residency in oral surgery with 4 months' general anesthesia training. Interested in association or purchasing practice in oral surgery; preferably in Illinois. Address A.D.A. Box No. 188.

MISCELLANEOUS

WANTED TO BUY—Old or used dental books or journals. Leo L. Bruder, 1 DeKalb Ave., Dept. 21, Brooklyn, N. Y. Dealer in out-of-print dental literature.

•

WANTED TO BUY—Airdent (used). Please quote price in first letter. Address A.D.A. Box No. 187.

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EQUIPMENT FOR SALE—Myers X-Ray, S. S. White small unit with engine, cabinet, old Ritter chair, Heidlerink Gas Machine, S. S. White sterilizer, forceps, elevators, and safe. Direct replies to Dr. S. M. Hinman, 102 Union Avenue, N., Cranford, N. J.

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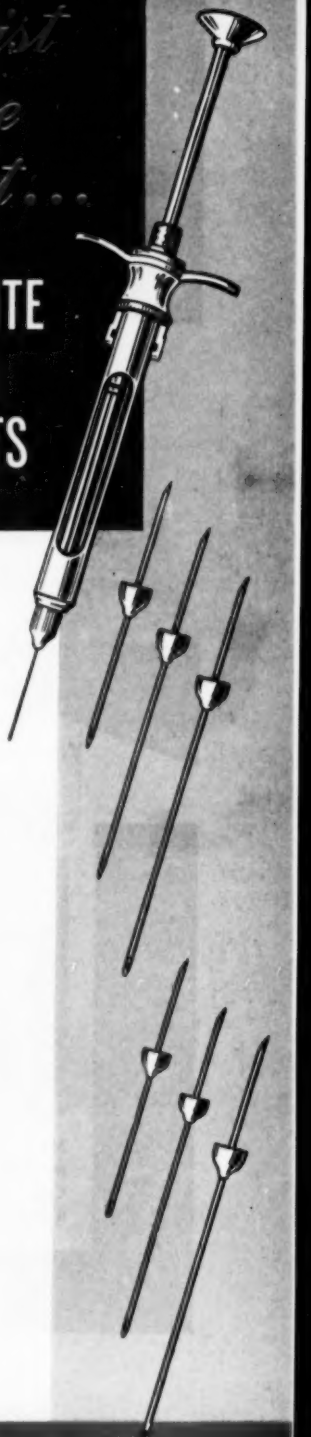

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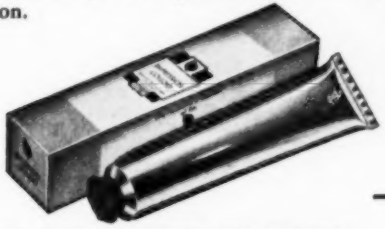

Actual photo of D-P Impression Colloid, removed from tube and bent double, illustrates material's pliability and strength!

YOU'LL ALSO LIKE THESE ADVANTAGES:

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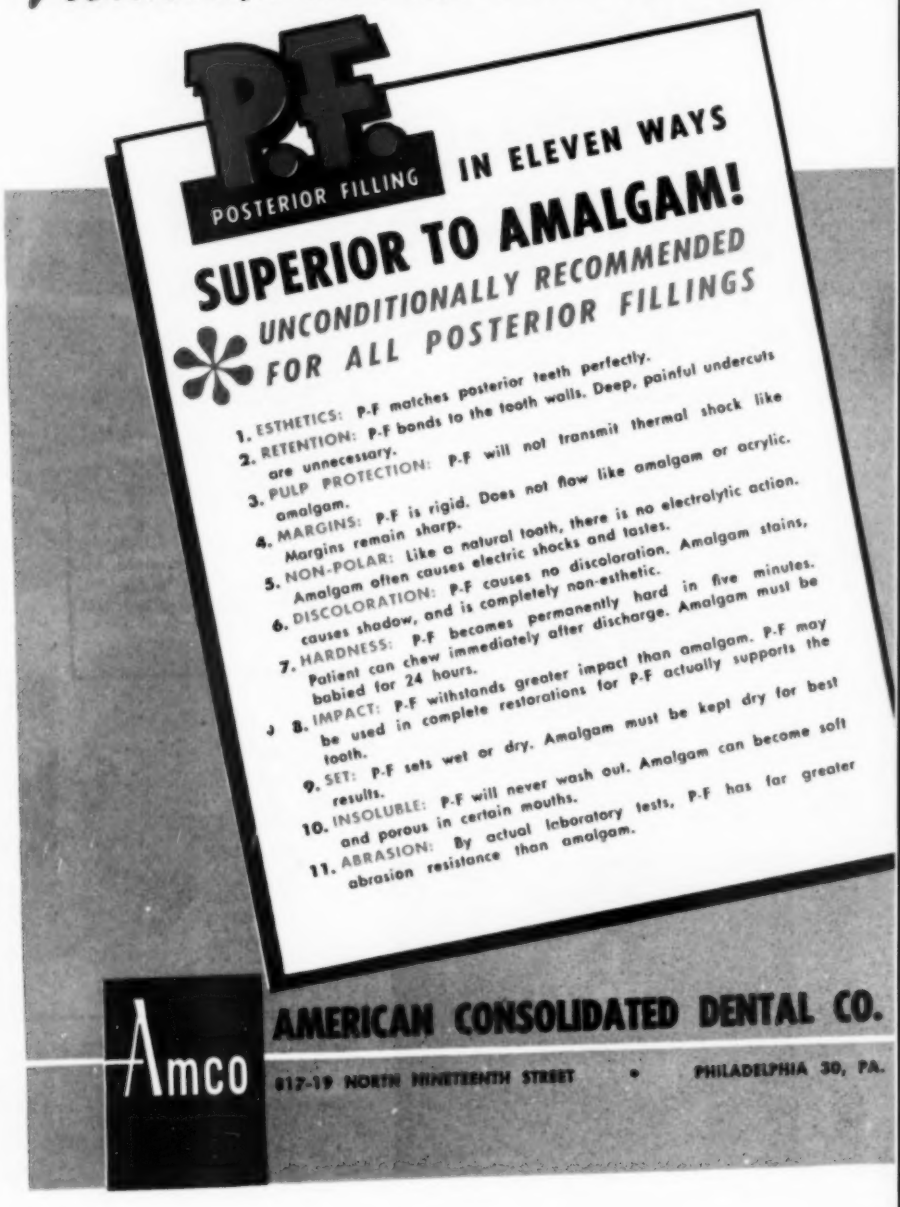
D-P 3 in 1 Cream for supremely accurate full denture impressions.

for: ESTHETIC, DURABLE, POSTERIOR FILLINGS.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8. IMPACT: P-F withstands greater impact than amalgam. P-F may be used in complete restorations for P-F actually supports the tooth.
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10. INSOLUBLE: P-F will never wash out. Amalgam can become soft and porous in certain mouths.
11. ABRASION: By actual laboratory tests, P-F has far greater abrasion resistance than amalgam.
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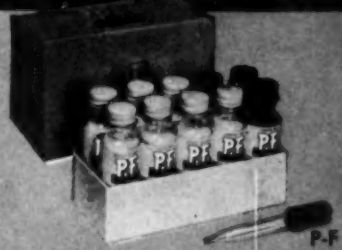

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TRY THIS P-F TEST: Prepare a cavity in a wet, natural, extracted tooth. Place wet P-F in dry preparation (no undercuts necessary). Allow P-F to set for 10 minutes (only 5 minutes necessary in the patient's mouth). Then *pound it, beat it, dry it, wet it, freeze it!* Do anything you can to dislodge the filling. You will be amazed!

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7—17 gm. Powders (1 each gingival dark, gingival medium, gingival light, occlusal grey, occlusal white and 2 occlusal transparent), 2—15 cc. Liquid, 1 eyedropper and sample of "Alevol" (Amco's new sterilizing and desensitizing solution), a $28.50 value only $25.00. Sold with full money-back guarantee.

A full colored 16 mm film on P-F the "Wonder filling of modern dentistry" available, without charge, to any recognized dental society or study group.

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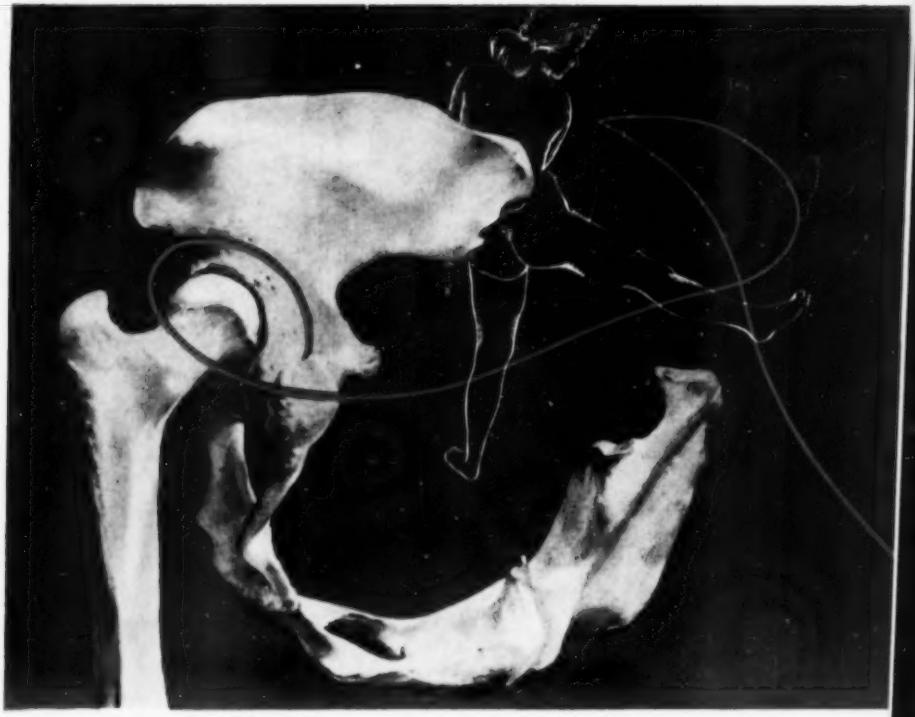

Man can move his limbs in more than one direction with ease, for they are connected with ball-and-socket action.

The mandibular joint acts like the hip-bone when tooth cusps are actually engaged, so that the mandible moves through an arc.

We have followed Nature's own pattern in our revolutionary posterior teeth. The new Justi-Form posteriors are carved with concave cuspal slopes that provide a "ball-and-socket action" compatible with the function of the joint.

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One thing more, Doctor. We have been able to give you much greater cutting efficiency because of drastically sharper intercuspal ridges. And there is no need to fear fracture with the newly developed, tougher S-R plastic.

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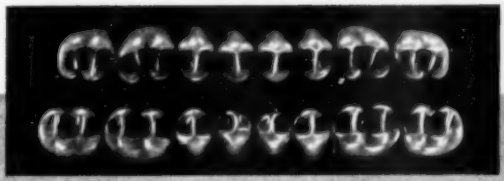

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Will tint and color any acrylic and co-polymer type denture base material, also Luxene and Jectron.

Hand-tinted gum sections, representing the 4 basic types of tissue coloring (1, 2, 3 and 4,) valuable as shade-guide, are available through your dealer.

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THE MOST IMPORTANT DEVELOPMENT IN PROSTHESIS, IN A DECADE.

With LIQUACOLOR REPLIDENT you can now easily match the exact gum tissue coloring of each patient, regardless of race, age or pathological condition.

Partial and full dentures whether new or presently worn, can be tinted with simple paint-on procedure right at the chair, without laboratory equipment.

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INTRODUCTORY KIT includes 2 oz. of Liquid, Dropper, 4 shades of powder (white, cream, yellow, grey). An $11.50 value for $10.00.

DuraCement is hard, strong, dense—non irritating to nerve, pulp or tissue—will not wash out, crumble or disintegrate. It is unaffected by heat, cold or mouth fluids; shows clearly on X-Ray film; sets in 6 minutes, in or out of mouth.

For permanence, use DuraCement for jackets, inlays, crowns, bridges, facings and tube teeth. Ideal for fillings in posterior teeth. Undercuts are not necessary. Color blending, consistency of mix and speed of application are easily controlled.

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why risk these HAZARDOUS TEMPERATURES

created by frictional heat of rotating cutting instruments

The following chart is based on data from a study recently conducted by the School of Dentistry, University of Michigan, Ann Arbor, Mich.*

TYPE BUR	COOLANT	DEGREES F. RISE AT 1 LB. PRESSURE			
		2000 RPM	4000 RPM	6000 RPM	10000 RPM
#37 Steel	None	37°	60°	78°	112°
	Air Only	17°	25°	33°	43°
	Air-Water Spray	4°	7°	9°	12°
#37 Tungsten Carbide	None	26°	42°	57°	84°
	Air Only	17°	25°	33°	45°
	Air-Water Spray	3°	6°	9°	12°
#701 Diamond	None	21°	30°	39°	52°
	Air Only	9°	14°	18°	25°
	Air-Water Spray	2°	4°	7°	9°

★ Report Published in New York Journal of Dentistry, 22:147-157 (April) 1952

NOTE: Degrees F. represent temperature rise above initial temperature of operating area. For example, at intermittent operation of 2 seconds cutting and 1 second rest, *without coolant*, a #37 steel bur at 1 lb. pressure and 6000 rpm increases the temperature 78° F. Accepting 90° F. as the initial temperature of the operating area, the cutting operation, therefore, brings the temperature in the tooth structure up to 168° F.

It can be readily seen that, even at minimum operating speeds and pressures, rotating cutting instruments create excessive heat, with needless risk of serious damage to tooth tissue and pain to the patient.

The Hanau Therm • Ex Spray, proved and acclaimed by thousands of users, effectively holds operative temperatures at a safe and tolerable level, *by providing at the tip of the bur an atomized water spray, or air only, as preferred.*

For further information, consult your dealer or write Hanau.

prevent frictional heat with

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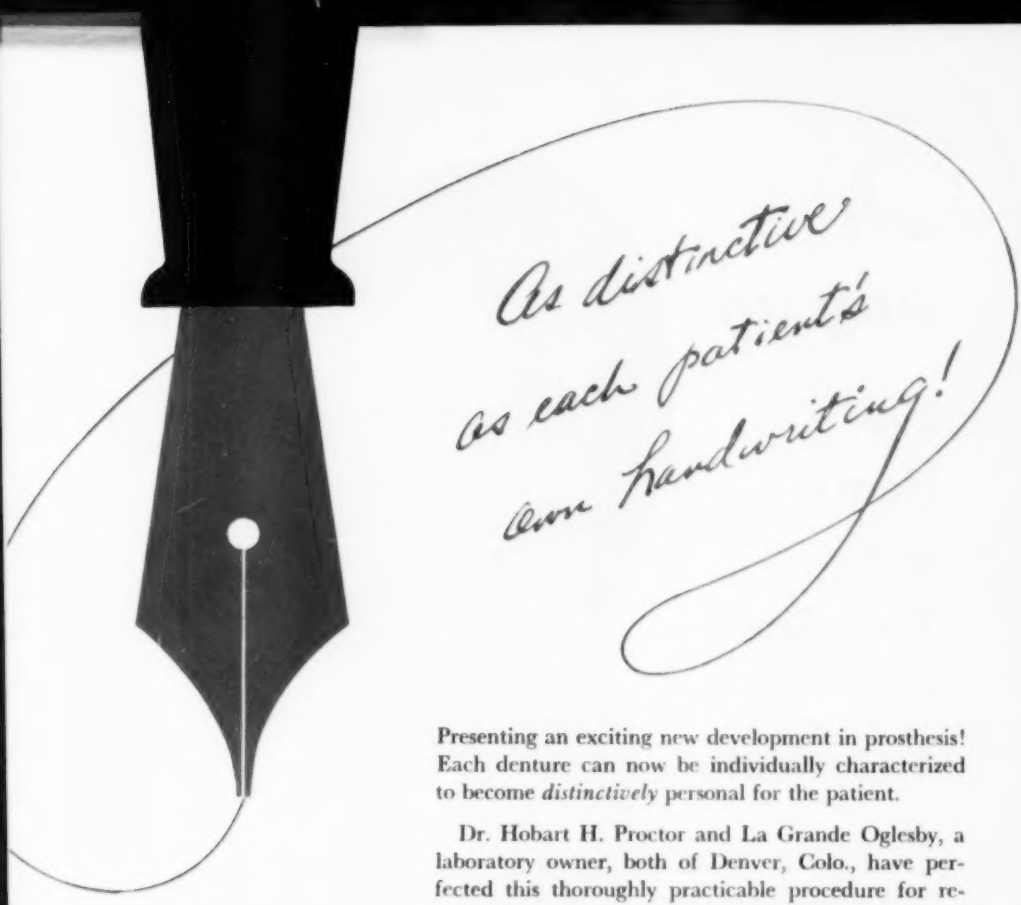

Presenting an exciting new development in prosthesis! Each denture can now be individually characterized to become *distinctively* personal for the patient.

Dr. Hobart H. Proctor and La Grande Oglesby, a laboratory owner, both of Denver, Colo., have perfected this thoroughly practicable procedure for reproducing in the denture the true coloration and vascular appearance of the soft tissues.

This development represents the greatest advance in prosthesis since acrylics arrived. It brings a refreshingly new approach to denture design and construction.

Write on your letterhead or professional card for the complete story on Lucitone Colorblend, and you will receive a copy direct. Address The L. D. Caulk Company, Milford, Delaware.

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For correcting compound impressions under equalizing pressure without stimulation or displacement of mouth tissue. Used with any impression technique in an individual impression tray constructed of base plate, metal, acrylic or vulcanite. Makes fine, accurate oral reproductions without shrinkage, expansion, drying out, or water absorption.

Immediate pouring of the cast is unnecessary, and the impression can be sent to the laboratory without fear of dimensional change.

Impressions made with S. S. White Impression Paste will retain their accuracy indefinitely, and may be inserted in the mouth as often as desired for testing the fit, with no danger of distortion. Ideal for rebasing impressions.

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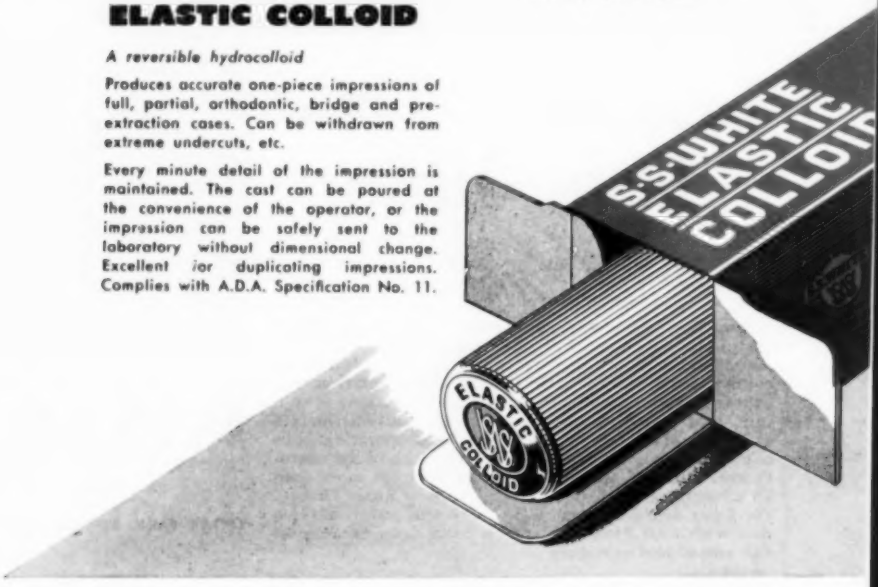
A reversible hydrocolloid

Produces accurate one-piece impressions of full, partial, orthodontic, bridge and pre-extraction cases. Can be withdrawn from extreme undercuts, etc.

Every minute detail of the impression is maintained. The cast can be poured at the convenience of the operator, or the impression can be safely sent to the laboratory without dimensional change. Excellent for duplicating impressions. Complies with A.D.A. Specification No. 11.



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(BLACK)

Working Temperature 131° to 136° F.— (55° to 58° C.)

Unexcelled for making individual trays for impression paste and plaster wash impressions. Also for full and partial impressions and impressions of inlay and jacket crown preparations.

Supplied in denture forms and sticks. Complies with A.D.A. Specification No. 3, first revision, for Type 2 Impression Compounds.

S·S·WHITE EXACT IMPRESSION COMPOUND

Becomes plastic at 120° F. (49° C.)
Quick setting
Reddish-brown in color

Can be used alone for impressions, or for perfecting impressions made of Impression Tray Compound, and for constructing individual impression trays.

Sold in denture forms, sticks and wafers.

The sticks are convenient for making corrections, muscle-trimming, post-damming, and for taking impressions in inlay and jacket crown work.

Conforms to A.D.A. Specification No. 3, first revision, for Type 1 Impression Compounds.

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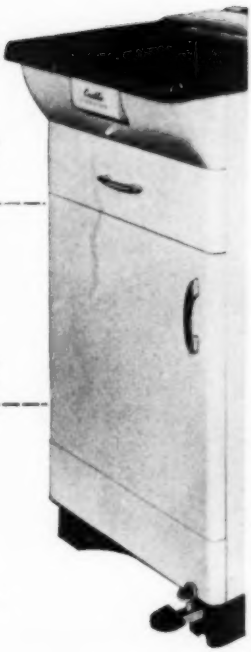

Tin-lined boiler cuts corrosion

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Aluminum base—can't stain floor

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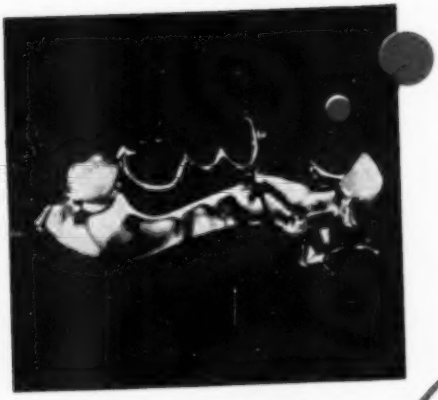

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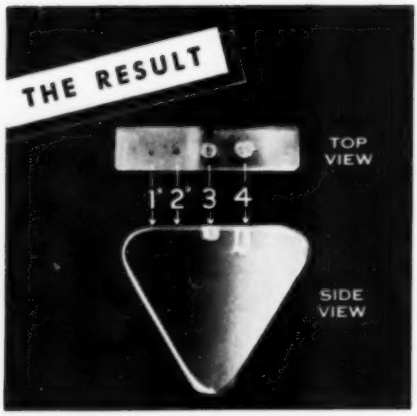

Flint Glass shows you the actual difference

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● Knoop Hardness of tooth enamel is 267 to 271 . . . For Flint Glass, it is 270.

Photo at top left shows how actual tests on Flint Glass were made. Photos at right show exact results.

Two new No. 8 Round *Steel* Burs were used for Cuts No. 1 and 2. Two new No. 8 Round *Kerr Carbex Tungsten Carbide Burs* were used for Cuts No. 3 and 4. Each cut was for six minutes . . . with Handpiece pressure at two pounds.

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Carbex Burs
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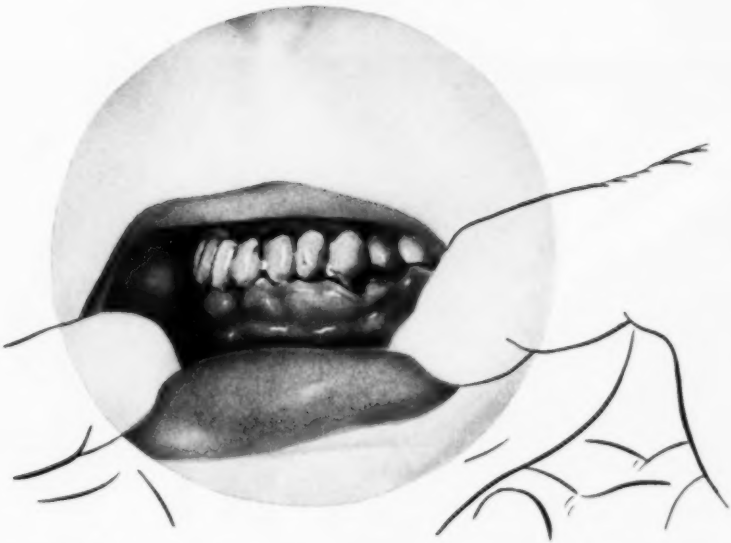

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Penicillin Chewing Troches
Parke-Davis

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ORYGENE Penicillin Chewing Troches have a fresh peppermint flavor which encourages retention in the mouth – further assurance of adequate exposure time at the site of the infection.

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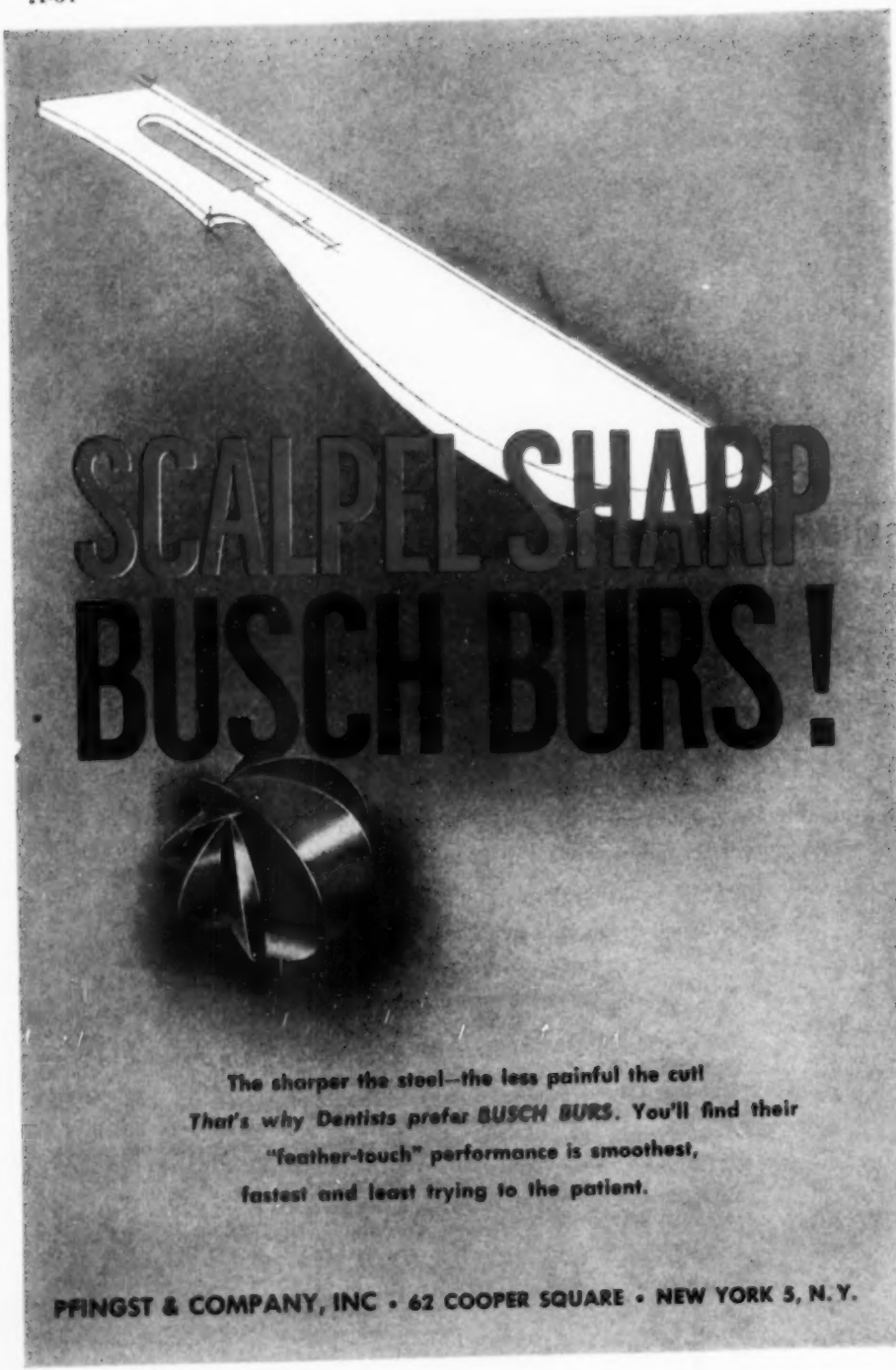
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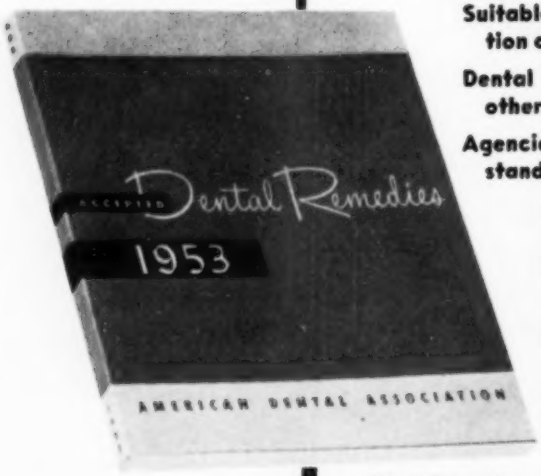

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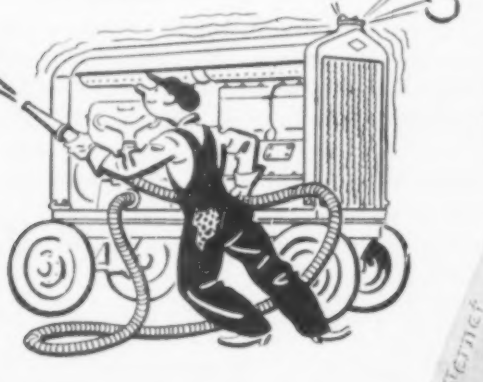

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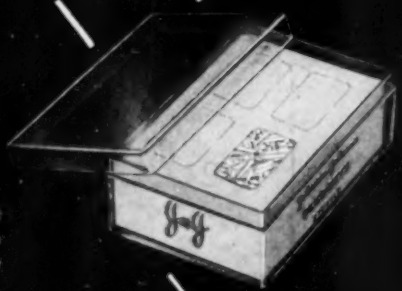

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